‘‘COMPARATIVE STUDY OF FLUOROSCOPY GUIDED TRANSFORAMINAL PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR LUMBAR DISC HERNIATION RADICULOPATHY’’

BY

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DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, KOLAR, KARNATAKA

In partial fulfillment of the requirements for the degree of

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IN

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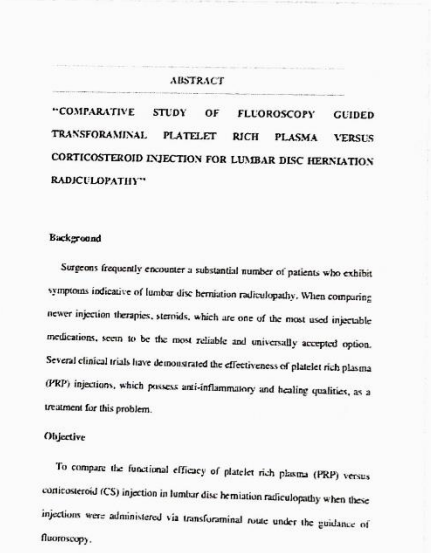

ABSTRACT

"COMPARATIVE STUDY OF FLUOROSCOPY GUIDED TRANSFORAMINAL PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR LUMBAR DISC HERNIATION RADICULOPATHY"

Background

Surgeons frequently encounter a substantial number of patients who exhibit symptoms indicative of lumbar disc herniation radiculopathy. When comparing newer injection therapies, steroids, which are one of the most used injectable medications, seem to be the most reliable and universally accepted option. Several clinical trials have demonstrated the effectiveness of platelet rich plasma (PRP) injections, which possess anti-inflammatory and healing qualities, as a treatment for this problem.

Objective

To compare the functional efficacy of platelet rich plasma (PRP) versus corticosteroid (CS) injection in lumbar disc herniation radiculopathy when these injections were administered via transforaminal route under the guidance of fluoroscopy.

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COMPARATIVE STUDY OF FLUOROSCOPY GUIDED TRANSFORAMINAL PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR LUMBAR DISC HERNIATION RADICULOPATHY

ABSTRACT

Background

Surgeons frequently encounter a substantial number of patients who exhibit symptoms indicative of lumbar disc herniation radiculopathy. When comparing newer injection therapies, steroids, which are one of the most used injectable medications, seem to be the most reliable and universally accepted option. Several clinical trials have demonstrated the effectiveness of platelet rich plasma (PRP) injections, which possess anti-inflammatory and healing qualities, as a treatment for this problem.

Objective

To compare the functional efficacy of platelet rich plasma (PRP) versus corticosteroid (CS) injection in lumbar disc herniation radiculopathy when these injections were administered via transforaminal route under the guidance of fluoroscopy.

Methodology

All patients diagnosed with lumbar disc herniation radiculopathy from September 2022 to December 2023 and admitted to the Orthopaedics department of RL Jalappa hospital in Kolar were taken up in the study. After a patient meets all inclusion and exclusion criteria, they had a thorough evaluation consisting of a medical history, physical exam, and imaging tests.

The 96 patients were split into two groups, Group A and Group B, equally. Following the acquisition of permission and surgical fitness, patients were administered PRP to group A via transforaminal injection and corticosteroids to group B. During the follow-up of 6 months, each patient was evaluated using the Modified Oswestry low back pain Disability Index (MODI), Visual Analog Scale (VAS), Modified Roland Morris sciatica score (MRM), and Core Measures Index (COMI).

Results

The mean age of the lumbar disc herniation radiculopathy (LDHR) patients in PRP group was 40.75 ± 10.8 years and the mean age of the LDHR patients in CS group was 43.52 ± 8.9 years. About 54.2% of the LDHR patients were male in PRP group, and the remaining 45.2% were female. Similarly, 52.1% of the LDHR patients were male in steroid group, and the remaining 47.9% were female.

In the treatment of LDHR patients, there was a consistent decline in VAS score after PRP and Steroid injection. Based on the findings it was inferred that PRP was better than Steroid in reducing perceived pain (VAS) at long term (6 months), whereas steroid was better than PRP in reducing perceived pain at short term (1 and 3 months).

In the treatment of LDHR patients, there was a consistent reduction in MODI disability score after PRP and steroid injection. Based on the findings it was inferred that PRP was better than Steroid in reducing disability (MODI) in the long term (3 and 6 months), whereas steroid was better than PRP in reducing disability at short term (1 month).

In the study LDHR patients, there was a consistent reduction in COMI outcome score after PRP and steroid injection. Based on the findings it was inferred that PRP was better than Steroid in improving outcome (COMI) at long term (6 months), whereas steroid was better than PRP in improving outcome at short term (1 and 3 months). But it didn't have any statistically significant. Hence there existed no difference in outcome (measured by COMI) between the PRP and Steroid groups after the injection.

In the treatment of LDHR patients, there was a consistent increase in MRM pain related disability score after PRP and steroid injection. Based on the findings it was inferred that PRP was superior than Steroid in MRM (reducing pain related disability) at long term (6 months), whereas steroid was superior to PRP in MRM (reducing pain related disability) at short term (1 and 3 months).

Conclusion

The results of the trial showed that CS and PRP were equally effective at reducing pain and functional impairment. However, the PRP group had a more pronounced and enduring decrease in pain intensity and enhancement in functional impairment compared to the steroid group in long term follow up.

Keywords: Lumbar Disc Herniation Radiculopathy, Epidural Steroid Injection, Platelet-Rich Plasma, Visual Analogue Scale, Modified Oswestry Low Back Pain Disability Index, Short Form Health Survey, Numerical Rating Scale, Modified Roland Morris Sciatica Score, Core Outcome Measures Index.

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ABBREVIATIONS

S. No	Abbreviation	Explanation
1	AF	Annulus Fibrosus
2	COMI	Core Outcome Measures Index
3	CS	Corticosteroid
4	CT	Computed Tomography
5	DDD	Degenerative Disc Disease
6	DH	Disc Herniation
7	EPRPI	Epidural Platelet-Rich Plasma Injection
8	ESI	Epidural Steroid Injection
9	HNP	Herniated Nucleus Pulposus
10	IVD	Intervertebral Disc
11	LBP	Low Back Pain
12	LDHR	Lumbar Disc Herniation Radiculopathy
13	LA	Local Anaesthesia

14	LDH	Lumbar Disc Herniation
15	LR	Lumbar Radiculopathy
16	LRP	Lumbar Radicular Pain
17	LSS	Lumbar Spinal Stenosis
18	MDCT	Multidetector Computed Tomography
19	MODI	Modified Oswestry Low Back Pain Disability Index
20	MRI	Magnetic Resonance Imaging
21	MRM	Modified Roland Morris Sciatica Score
22	MSU	Michigan State University
23	NP	Nucleus Pulposus
24	NSAID	Non-Steroidal Anti-Inflammatory Drug
25	NRS	Numerical Rating Scale
26	PRP	Platelet-Rich Plasma
27	PPP	Platelet Poor Plasma
28	RBC	Red Blood Cells

29	SF-36	36-Item Short Form Health Survey
30	SI	Sacroiliac Joint
31	SLRT	Straight Leg Raising Test
32	SNRB	Selective Nerve Root Block
33	TFR	Transforaminal Route
34	VAS	Visual Analogue Scale
35	WBC	White Blood Cells

INTRODUCTION

Low back pain (LBP) is a highly widespread health condition that affects the entire population. [1] It is a prominent factor contributing to physical disability in individuals across many age groups, including both older and younger populations. It has significant impacts on both health and socioeconomic position.[2] Approximately 75-84% of the overall population experience LBP, and within this group, it is believed that 5-10% of individuals suffer from LBP that leads to significant morbidity, heightened healthcare expenses, sick leaves, and personal distress. [3,4]

According to the findings of the study that was carried out by Jella Ramdas and colleagues, the age group that is most frequently affected by LBP in males is between the ages of 31 and 40 (38.6% prevalence), whereas in females they are between the ages of 41 and 50 (38.1% prevalence). [1,86] Although there are numerous potential causes of low back pain, the most prevalent one is disc herniations (DH) caused by intervertebral disc (IVD) degeneration and degenerative disc disease (DDD). [5] When it comes to the lumbar region, over 95% of a disc herniations (DH) happen between L4-5 or between L5-S1. [6]

Herniation of the nucleus pulposus (NP) from the IVD space, known medically as DH, is the root cause of LBP. In addition to numbness or tingling, the pain could be burning or stinging and spread to the lower extremities. The spinal disc acts as a shock absorber between the vertebrae, which in turn

stabilizes the spine. When the disc presses on a nerve or spinal cord, it might cause pain on occasion. [7] Epidural inflammation brought on by cytokines and other pro-inflammatory chemicals released into the bloodstream by local immune responses produced by migrating NP tissue into the epidural space may be the cause of LBP and Lumbar Radicular Pain (LRP). [84,85]

When it comes to treating acute cervical and LRs caused by DHs, non-surgical therapies like physical therapy and NSAID constitute the gold standard. While these are effective in alleviating debilitating pain, quick surgical consultation is necessary for patients with neurological impairments or who do not show improvement with conservative treatment. [7]

Intrusive operations like lumbar discectomy and Epidural Steroid Injections (ESIs) are often used for patients who do not make a full recovery after a spinal cord injury. [8,9] The idea that inflammation of the afflicted lumbar nerve root causes radicular symptoms is often made while offering ESIs, despite conflicting data to the contrary. [10] Patients undergoing epidural steroid injections are subjected to fluoroscopic radiation, undergo an invasive treatment, and are typically required to have a pre-operation Magnetic Resonance Imaging (MRI) scan. [8] There are several benefits to choosing oral steroid medicine over an ESI. These include the fact that it is safer, less expensive, may be quickly delivered by primary care physicians, and does not entail radiation or an MRI. [8]

Multiple studies have demonstrated that ESI is a highly successful treatment for LDH, even after more than 30 years of use. It enhances functionality, reduces inflammation, and relieves pain. There are three distinct methods of administering steroids: interlaminar, transforaminal, or caudal injection. [11] Triamcinolone acetonide, xylocaine, betamethasone, bupivacaine, and methylprednisolone are among the drugs that are utilized. [12]

Currently there is growing trends of using Platelet-Rich Plasma (PRP) by Orthopaedician as an alternative to CS as they have properties of regeneration along with analgesic effects. They may therefore offer a better outcome for the problem. [2]

A relatively new form of treatment known as Orthobiologics, PRP has been gaining popularity in recent years. [13] Platelets secrete a plethora of proteins and growth factors (Table 3) that promote cell proliferation, recruitment, and differentiation—all of which are essential for the regeneration process. Platelets have the ability to regulate inflammatory responses and immunological elements of tissue repair through the release of cytokines, chemokines, and chemokine receptors. Additionally, platelets block anti-inflammatory cytokines from recruiting too many white blood cells. Injured areas can get platelets, which have antimicrobial proteins. Platelets bind damaged skin cells together while the wound heals. The same holds true for disc tears caused by degeneration: platelets bind the borders together, allowing cells to repair.

Degenerative intervertebral discs may have their extracellular matrixes repaired by the growth factors delivered into the bloodstream. Additional research is necessary to confirm the results of these regenerative and analgesic benefits of PRP. [14,15]

With an emphasis on functional outcomes, the current study aimed to asses the efficacy of transforaminal administration of PRP injection and Corticosteroid (CS) in treating lower limb Lumbar Radiculopathy (LR) due to Lumbar Disc Herniation (LDH). We compared the functional efficacy of CS injection and PRP in the treatment of LDH-induced lumbar radiculopathy.

OBJECTIVES

1. To determine the efficacy of corticosteroid injection via transforaminal route (TFR) in lumbar disc herniation radiculopathy based on the functional outcome.

2. To determine the efficacy of PRP injection via TFR in lumbar disc herniation radiculopathy based on the functional outcome.

3. To compare the functional efficacy of PRP versus CS injection in lumbar disc herniation radiculopathy

ANATOMY AND REVIEW OF LITERATURE

Low back pain

A sizable segment of the population suffers from low back pain (LBP). Almost 80% of people will experience LBP. Although most people get over the pain quickly, the disability that follows usually limits their adult activities, second only to arthritis in terms of restriction. [1]

There have been numerous reports of persons experiencing low back discomfort, particularly as a result of activities related to their jobs or occupations. A lot of people get sick from it, which means they miss work and other activities and end up in the hospital a lot. It causes emotional and physical distress for the person and their loved ones, as well as financial strain from repeated trips to the hospital.

Reports of LBP have come in from all across the globe, in both developed and developing nations. [1] Although there are numerous potential causes of LBP, the most prevalent one is DDD, and herniation of the lumbar discs caused by intervertebral degeneration. Therefore, it is critically important to comprehend LDH, where it comes from, and how to treat it properly.

Intervertebral Discs[16]

The lower and upper portions of the vertebral articular processes are joined by the zygapophyseal joints, and the vertebral bodies' joints allow adjacent vertebrae to articulate with one another. When it comes to the spine's ability to support weight, the former helps to restrict motion, while the latter both enhances and distributes it. IVDs connect the lower surfaces of the upper and lower vertebrae, allowing the two bodies to articulate with one another.

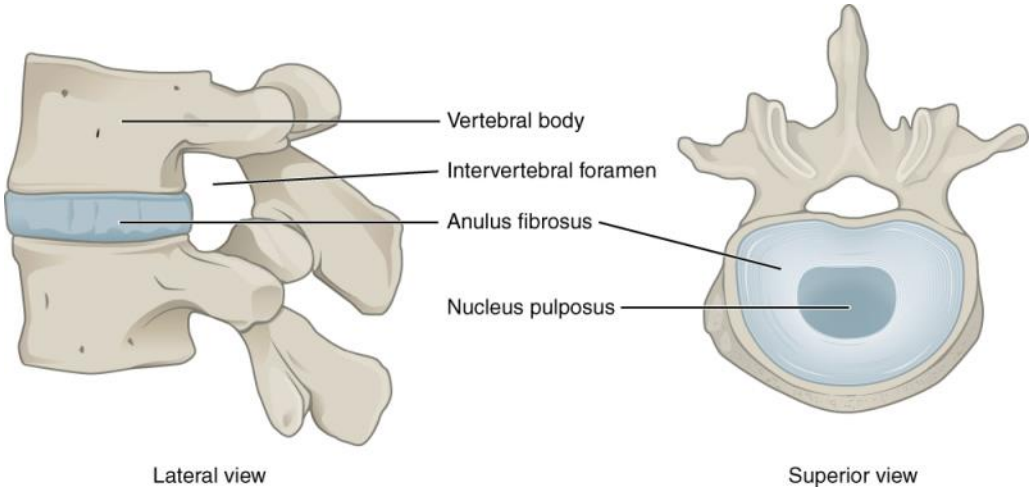

Figure 1: Intervertebral Disc. This lateral perspective displays the intervertebral disc situated between two adjacent vertebrae. The top view reveals the annulus fibrosis located in the outer layer and the nucleus pulposus situated in the inner layer.[16]

There are 26 discs in the spinal column: five lumbar discs, twelve thoracic discs, seven cervical discs, one sacral disc, and twelve thoracic discs. These discs makes up about 25-33% of the total length of the spinal column. They

facilitate the flexibility of the spine while maintaining a significant amount of strength. Furthermore, they not only absorb shock within the spine but also protect the vertebrae from experiencing friction against one other.

Figure 1: Illustrates the three primary components that make up a disc: the NP on the interior, the annulus fibrosus (AF) on the exterior, and the cartilaginous endplates that are responsible for attaching the discs to the vertebrae that are adjacent to them.

Lumbar Disc Herniation[5]

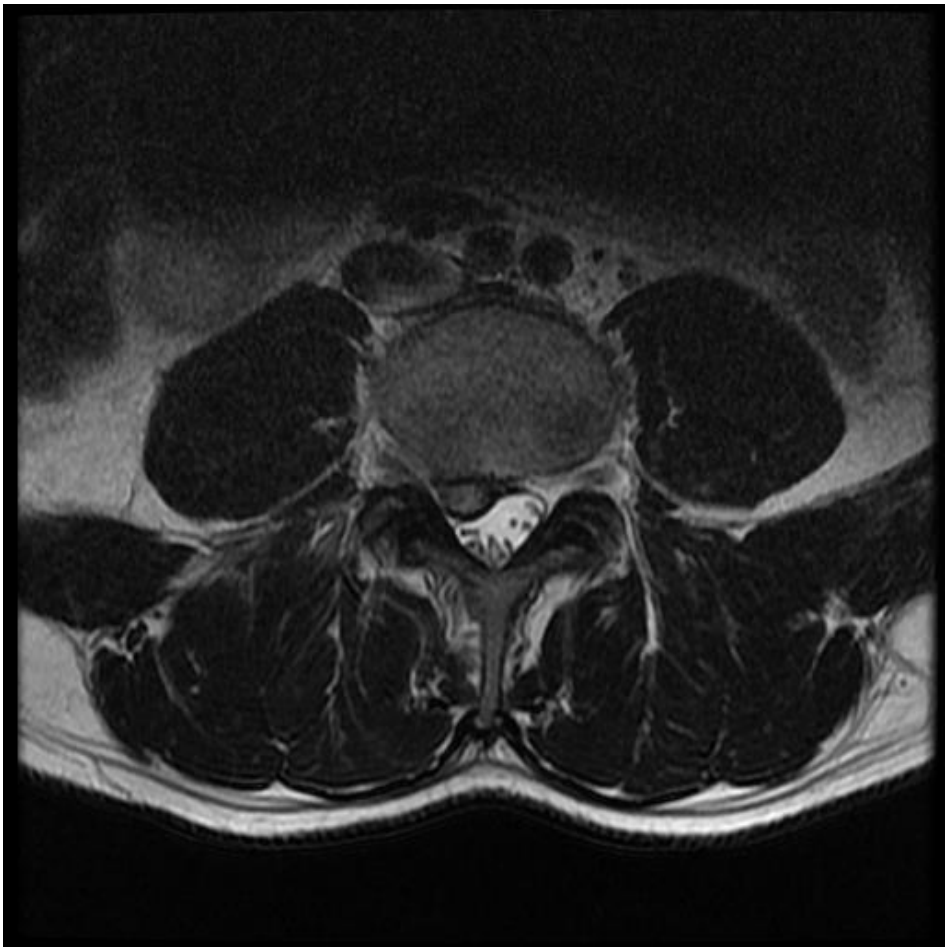

Figure 2: MRI of Lumbar Spine showing Disc Herniation[5]

The lumbar spine has a lordotic curve and is made up of five vertebrae and intervertebral discs. The articular processes, laminae, pedicles, and intervertebral discs of neighbouring vertebrae form an aperture through which the spinal nerves exit. The NP is implicated in a disc herniation. Disc herniation commonly leads to the compression of an adjacent spinal nerve, which is a significant consequence. When the intervertebral disc located between the fourth and fifth vertebrae herniates, it exerts pressure on the nerve root associated with the lumbar region of the spine. A reason for the weakening of the posterior longitudinal ligament in the lumbar-sacral region, specifically at the L5-S1 level, is a potential cause of disc herniation in that area. There are four subtypes of herniations:

1. When the edge of a disc presses down on neighbouring vertebral endplates, a **disc bulge** forms. It is common for patients to show no symptoms at this point.

2. When a disc protrusion's base width is larger than the herniated disc material's diameter, this defines the **disc protrusion** as a distinct feature. Patient may have pain at the location where the prolapsed disc is located.

3. The AF damage results in the NP protruding beyond the normal bounds of the disc, which is referred to as **disc extrusion**. In this case, the herniated material forms a dome shape resembling a mushroom, which is wider than

the neck connecting it to the body of the NP. Regarding the disc level, the herniation can extend either upwards or downwards.

4. **Disc sequestration** involves the separation of the herniated material from the nucleus pulposus. During phases three and four, it is common to experience tingling, numbness, and weakness along with pain in the surrounding tissues. Additionally, the patient is paralyzed, which manifests as numbness, tingling, and weakness in the legs and lower back.

Epidemiology

There are about 5 to 20 cases of herniated discs in the back of per thousand adults each year. In a 2:1 male-to-female ratio, LDH is seen between the ages of 30 and 50. [17]

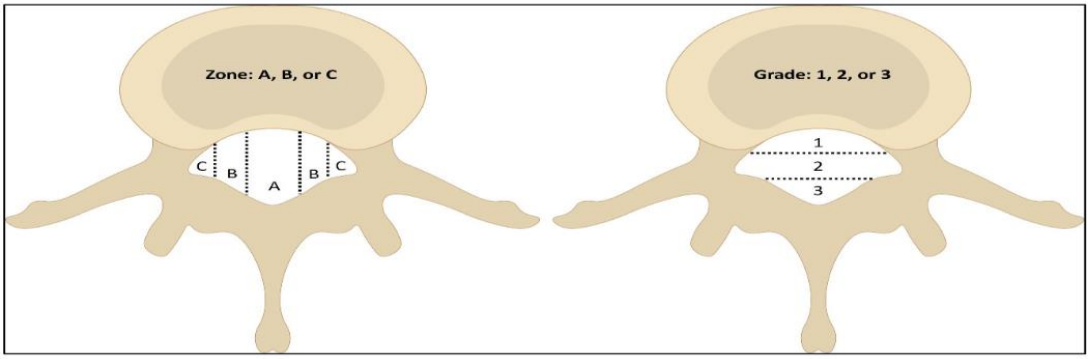

Figure 3: The classification of lumbar Herniated Nucleus Pulposus (HNP) is determined using the Michigan State University (MSU) approach, which considers both the extent and location of the disc herniation. MSU employs a scale of magnitude grades ranging from 1 to 3 to assess the severity of herniation, as well as a classification system for the location of herniation from medial to lateral, categorized as zone A to zone C. [18]

Classification of Lumbar Disc Herniation

The location of the herniation, the degree of nerve root involvement, the patient's clinical presentation, the severity of the condition, and the direction of the herniation are some of the factors that determine the classification of lumbar disc herniation. There are four primary forms of herniation observed in the back: disc bulging, protrusion, extrusion, and sequestration. [18]

A **disc bulge** is defined as an asymmetrical protrusion, typically on one side, that occurs when the disc's outer edge extends beyond the normal limits of the vertebral body while maintaining a consistent circumference.

Disc protrusion is categorized when the protrusion's base width exceeds the diameter of the substance that has breached the disc material, and it extends beyond the typical limits of the disc without causing damage to the annulus fibrosus.

Disc extrusion refers to the protrusion of the nucleus pulposus beyond its normal boundaries when the annulus fibrosus is injured.

Sequestration can occur when the annulus structure is completely ruptured and the nucleus pulposus fragment moves out of the disc space after the nucleus material has been forced out. [18]

Clinical Presentation

Radiographic discomfort, changes in sensation, and a lack of strength along the course of a lumbosacral nerve root or roots are the main manifestations of LBP. Localised paresis, restricted back flexion, and leg pain after straining, coughing, or sneezing are possible additional symptoms. [19] As sitting has been shown to increase disc pressure by about 40%, patients frequently report feeling more uncomfortable when sitting. [6]

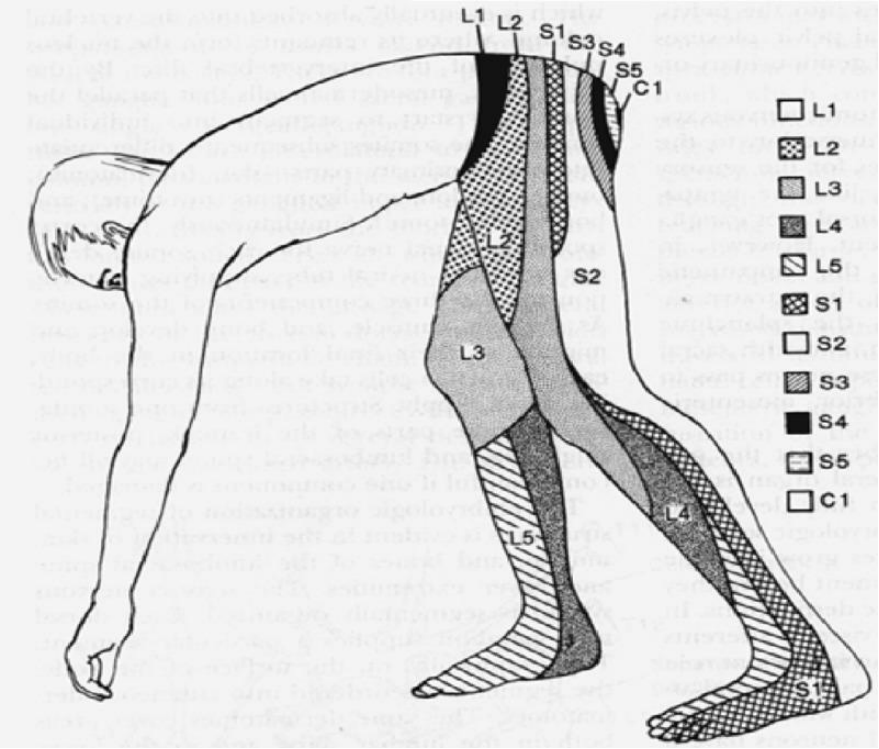

Figure 4: Illustration depicting the anatomical distribution of sensory dermatomes in the Lumbo-sacrococcygeal area.[20]

In cases of radiculopathy caused by nerve root compression pain, a dermatomal pattern of sensory loss is typically observed (Figure 1). The distribution of motor loss in the myotomes is illustrated in Table 1. To establish

the specific region of the spine to focus on, the surgeon should utilize other modalities such as MRI and electrodiagnostic testing. This decision should be based on the distribution of motor findings and pain observed during the physical examination.[20]

Spinal Nerve	Myotome
L2	Hip Flexion Iliopsoas
L3	Knee Extension
L4	Ankle Dorsiflexion Tibialis Anterior
L5	Ankle Eversion (peronous longus and brevis) Great Toe Extension Extensor Hallucis Longus
S1	Plantar Flexion Gastrocnemius, Soleus

Table 1: Anatomical distribution of lumbosacral myotomes[20]

Various forms and severities of herniation have distinct impacts on the dermatome. The far lateral herniations put pressure on the departing nerve root, paracentral herniations put pressure on the transversing nerve root. Examine the distinction between L4-5 radiculopathy, which is caused by a paracentral herniation, and L4 radiculopathy, which is caused by a far lateral herniation at the same level. [21]

The main reason for pain reduction during seated forward flexion is more likely to be due to Lumbar Spinal Stenosis (LSS) rather than solitary LDH, as this movement increases disc pressure by 100-400%. [21] At a recent study conducted by Rainville et al., they compared the symptoms of LDH with those of LSS. According to the study, LSS is associated with increased rates of

medical comorbidities, reduced levels LRP, altered Achilles reflexes, and specific forms of discomfort at the back of the knee. [22]

Diagnostic Guidelines

The LDH with Radiculopathy Work Group of the North American Spine Society's (NASS) Evidence-Based Guideline Development Committee suggested in 2014 that manual muscle testing, sensory testing, and the supine straight leg raise test (SLRT) - including its crossed leg variation, Multidetector Computed Tomography (MDCT) should be considered the most reliable methods for clinically diagnosing LDH. [6]

Imaging

Radiographs

When diagnosing LBP, plain radiographs are typically the recommended imaging modality. Primary care physicians are advised to delay ordering radiographs for a period of 6-12 weeks, unless there is a decline in neurological function. We advise getting flexion and extension sequences to assess the instability patient's spine, including lateral and anteroposterior (AP) images. Indicators of LDH in this method consist of traction osteophytes, diminished intervertebral space, and compensatory scoliosis. [6]

Magnetic Resonance Imaging

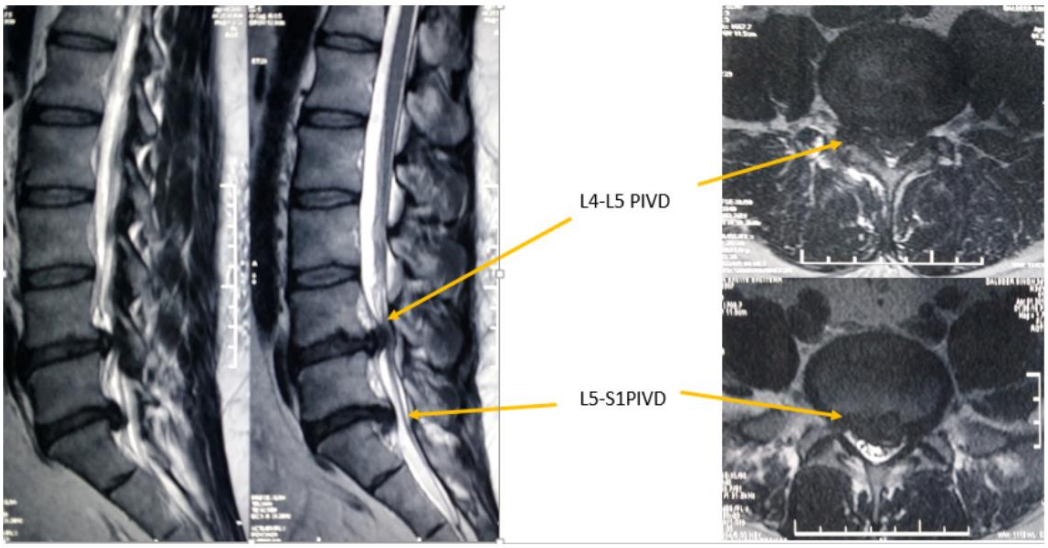

Figure 5: The above MRI revealed disc herniation at the L4-L5 and L5-S1 levels.[23]

MRI is the imaging used for verifying suspected LDH because of its 97% diagnostic accuracy and good inter-observer reliability. [24,25] An MRI scan showing an elevated T2-weighted signal in the posterior 10% of the disc's diameter is strongly predictive of a DH. [26] Not all patients with LDH should undergo this testing because of the high resource requirements. Neurologic motor impairments and Cauda equina syndrome are two signs that need an MRI scan during the initial phase of LDH (< 6 weeks). When it comes to radiological studies, MRI is crucial because of how well it helps to define structures in soft tissues.

Electrophysiological tests

Electrophysiological testing is useful for identifying the cause of radiculopathy when MRI results do not align with clinical observations. It helps determine if the radiculopathy is caused by metabolic factors, central nervous system problems, peripheral neurological disorders, or nerve root compression at the disc level.

Computed Tomography (CT)

For a long time CT was considered to be diagnostically inferior to MRI when it came to detecting LDH. However, recent improvements in CT, such as MDCT, have brought CT's diagnostic skills to a level that is practically on par with MRI. [27,28] In place of MRI, CT myelography is an appropriate diagnostic tool that can confirm the presence of LDH.

Block

When an MRI scan reveals numerous levels of disc herniation, it might be challenging to determine which level is the problematic one. In these kinds of situations, diagnostic methods like as epidural injections, SNRB, and intraarticular injections in the facets and SI can be utilized to detect the pathology more precisely.

Lumbar Disc Herniation Radiculopathy

Surgeons frequently encounter a substantial number of patients who exhibit symptoms indicative with LR. Approximately 3-5% of the population, encompassing both males and females, experiences this condition. Degenerative spondyloarthropathies are the primary cause of LR. Patients frequently report experiencing back pain when they visit the doctor because of their radiculopathy. Radiculopathy is characterized by symptoms such as sharp, intense, or scorching pain that radiates down the legs. Radiculopathy, the most common underlying cause of which is nerve compression, refers to the inflammation of a specific nerve that can be at any point along its length. [20]

The prevalence rate of sacral and LR in patient groups is estimated to be between 3% to 5% according to most reports. However, there is a lack of thorough epidemiologic data in the literature. Furthermore, individuals suffering with this condition are frequently sent to neurosurgeons, orthopaedic spine surgeons, or neurologists. [29]

LBP is thought to affect 13% to 31% of people, and radicular symptoms are thought to affect 12% to 40% of those with LBP. After diseases of the upper respiratory tract, LBP is the leading cause of work absences among employees. LBP affects about five million people, which means that almost 25 million people miss work because of it. Patients with prolonged back pain are responsible for 80–90% of healthcare costs. [29]

Management of Lumbar Disc Herniation Radiculopathy (LDHR)

As a result of the fact that the majority of LDH symptoms are temporary and disappear within six to eight weeks, the condition is typically treated cautiously at first, unless serious warning indications demonstrate themselves. Recent research has demonstrated that conservative and surgical treatments produce comparable medium to long-term results. Although there is a lack of study on a universally agreed criterion for determining whether surgery is required, there are relative indicators that patients who exhibit warning signals should have immediate surgical intervention. The treatment is determined on the aetiology as well as the severity of the symptoms.

Non-surgical interventions for addressing LDHR.[18]

Intervention	Description
Patient Education and Self-Management	A comprehensive area of healthcare that focuses on providing information and support to patients, empowering them to make informed decisions about their health and well-being. The patient education domain encompasses various elements to enhance patients' understanding of their medical conditions, treatment options, and self-care strategies.
Electro-Diagnosis-Based Management	A method for determining the proper spine posture during manipulation that can help decompress the nerve root.
McKenzie Method	A method of classification based on variations in symptoms associated with low-back pain (and/or lower extremity in response to repeated direction-specific movements of the lumbar spine). The findings are employed to categorize patients into different syndromes (derangement, dysfunction, or postural), directing the choice of treatment approach.
Mobilization and Manipulation	Mobilization is a manual therapy technique that involves passive movement applied to a joint or soft tissue to restore or enhance range of motion. Manipulation, also known as high-velocity, low-amplitude thrust (HVLA), is a manual therapy technique involving a quick, controlled force applied to a joint beyond its passive range of motion. Both are used to address musculoskeletal issues, improve joint mobility and reduce pain.

Exercise Therapy	Exercise therapy is a crucial component of the management and rehabilitation of disc herniation. The primary goals of exercise therapy for disc herniation include improving flexibility, strength, posture, and overall function, while also addressing pain and preventing future issues.
Traction	A treatment involving the application of manual or mechanical forces with the aim of stretching and separating the spine; or, in the case of LET, the goal is restoring the natural lumbar lordosis.
Neural Mobilization	A therapeutic intervention involving systematic and controlled movements of neural tissues, including nerves, to alleviate neural tension, improve nerve glide, and optimize neurophysiological function.
Laser and Ultrasound	Therapeutic modalities used in physiotherapy.
Electrotherapy	Electrotherapy modalities entail introducing physical energy into a biological system, leading to specific physiological changes utilized for therapeutic advantages.
Dry Needling	A technique that utilizes thin, solid needles to penetrate the skin and stimulate underlying myofascial trigger points, providing relief from muscle tension and pain, and promoting muscle function.
Epidural Injection	Epidural injection for nerve block is a common medical procedure used to alleviate pain and inflammation associated with conditions such as disc herniation. This intervention involves the injection of medication into the epidural space, which is the space surrounding the spinal cord and nerve roots.

Table 2: Non-surgical intervention interventions for addressing LDHR

Epidural Steroid injection

Multiple research studies have consistently shown the effectiveness of ESI in treating LDH. This treatment has been widely used for more than three decades. [12,30–32] When comparing newer injection therapies, steroids, which are one of the most commonly used injectable medications, seem to be the most reliable and universally accepted option. [33] However, previous unregulated studies have indicated that injecting steroids directly into the joint only provides a long-term reduction in LBP ranging from 18% to 63%. [34] Furthermore, it enhances functionality in addition to mitigating pain and inflammation. The three

potential alternatives are intramuscular, transforaminal, and caudal injections of steroids.[11]

The transforaminal approach was more effective than the other two methods because it could reduce inflammation caused by compression at specific locations, including the spinal nerve, anterior epidural space, and dorsal root ganglion. [35,36] Nevertheless, doubts regarding the effectiveness of ESI continue to exist. Using an oblique view on a fluoroscopic x-ray, this procedure entails identifying the lateral foraminal area between two neighbouring vertebrae while the patient is lying down and facing downward. One can observe anatomical features, such as the typical "Scottie dog," which can be helpful for guiding needles.

Transforaminal PRP injection: While under the effects of local anaesthesia (LA), the patient is positioned in a prone position. Indicate a location three to five centimetres from the centre line for injection. Next, analyse the region on the right side of the C-arm that is displaying symptoms related to that side. Align the uppermost segment of the lumbar spine with the space between the discs by positioning the C-arm head at a diagonal angle. Insert the 22G Spine needle in line with the lamp head and continue until it passes the outer edge of the superior joint. The tip of the needle should be in contact with the seam between the pedicles by adjusting the lamp head in both the forward and backward directions. The light head should be positioned at an angle to the side,

and the tip of the needle should be situated at the bottom of the corresponding hole. To ascertain the presence of cerebrospinal fluid or blood, carefully extract the syringe. Administer 1 millilitres of Iohexol contrast agent and track its movement via the nerve roots into the epidural area using the C-arm. [37]

Brain damage, pharmacologic effects of steroids, and neurotoxicity are some of the issues that have been brought up in relation to epidural steroid injection in the literature. [35,36] The contraindications of steroid use, which include infections, severe hypertension, pregnancy, allergies, diabetes, and osteoporosis, further restrict the use of epidural steroid injections.

Surgery carries hazards when conditions such as infection, paralysis, spinal discomfort, haemorrhage, or haematoma are present. Steroid use has been shown to be associated with the development of septic and aseptic meningitis, spinal cord embolisms, and various other problems. Steroids not only reduce the hypoglycaemic effects of insulin and make it more difficult for diabetics to control their blood glucose levels, but they are also linked to severe cases of Cushing syndrome, adrenal suppression, and myopathy. [35]

Currently, the available choices for alleviating pain by epidural administration are limited to a combination of steroid injections with opioids and LAs. In addition, pain relief has traditionally been of limited duration, lasting anywhere from one week to one year. [36]

Complications of Epidural steroid injections: [5]

1. Nerve injury
2. Bleeding
3. Infection
4. Allergic reaction
5. Numbness and/or tingling of upper and lower limbs
6. Dural puncture, resulting in positional headache
7. Pain of upper and lower limbs
8. Side effects of CS - “transient flushing/hot flashes, fluid retention, weight gain, elevated blood sugars, and mood swings”
9. Adrenal suppression
10. Epidural abscess
11. Epidural hematoma
12. Paralysis

PRP injection

A biological byproduct of autologous blood centrifugation, it has a high platelet concentration in a relatively small amount of plasma and alleviates pain associated with a variety of musculoskeletal disorders, including osteoarthritis, tendinosis, and ligament tears. [36]

Tendon, ligament, muscle, and bone healing can be influenced by the bioactive proteins, cytokines, and activated growth factors found in PRP. [38,39] By enhancing cell proliferation, migration, and differentiation; protein transcription; extracellular matrix regeneration; angiogenesis; and collagen synthesis, these components function as humoral mediators to generate an anti-inflammatory response and the natural healing cascade. [40,41]

Preparation of Platelet-Rich Plasma

The patient blood (~30ml) will be initially collected during treatment. To delay the platelet's activation, an anticoagulant is administered. The PRP forms one of several layers that are separated from the blood sample by centrifugation. There is a clear relationship between the initial platelet count and the volume of PRP. Here, one can finish getting ready by using either the PRP method or the buffy coat approach. [42]

Platelet Growth Factor Type	Growth factor Source	Biological Actions
Platelet derived growth factor (a-b)	Platelets, osteoblasts, endothelial cells, macrophages, monocytes, smooth muscle cells	Mitogenic for mesenchymal cells and osteoblasts, stimulates chemotaxis and mitogenesis in fibroblast/glial/smooth muscle cells, regulates collagenase secretion and collagen synthesis, stimulate macrophage and neutrophil chemotaxis
Transforming growth factor TGF (alpha-beta)	Platelets, extracellular matrix of bone, cartilage matrix, activated TH1 cells and natural killer cells, macrophages/monocytes, and neutrophils	Stimulates undifferented mesenchymal cell proliferation; regulates endothelial, fibroblastic, and osteoblastic mitogenesis; regulates collagen synthesis and collagenase secretion, regulates mitogenic effects of growth factors, stimulate endothelial chemotaxis and angiogenesis, inhibits macrophage and lymphocyte proliferation
Vascular endothelial growth factor, VEGF	Platelets, endothelial cells	Increases angiogenesis and vessel permeability, stimulates mitogenesis for endothelial cells
Epidermal growth factor, EGF	Platelets, macrophages, monocytes	Stimulates endothelial chemotaxis / angiogenesis, regulates collagenase secretion, stimulates epithelial/mesenchymal mitogenesis
Fibroblast growth factor, FGF	Platelets, macrophages, mesenchymal cells, chondrocytes, osteoblasts	Promotes growth and differentiation of chondrocytes and osteoblasts, mitogenic for mesenchymal cells, chondrocytes, and osteoblasts
Connective tissue growth factor CTGF	Platelets through endocytosis from extracellular environment in bone marrow	Promotes angiogenesis, cartilage regeneration, fibrosis, and platelet adhesion
Insulin like growth factor- 1 IGF-1	Plasma, epithelial cells, endothelial cells, fibroblasts, smooth muscle cells, osteoblasts, bone matrix	Chemotaxis for fibroblasts and stimulates protein synthesis. Enhances bone formation by proliferation and differentiation of osteoblasts

Table 3: Platelet growth factors and their specific characteristics[43]

Platelet-Rich Plasma Method

The process of centrifuging the blood at a constant acceleration (also known as "soft spin" – 1600rpm for 10min) is the initial stage in the process of concentrating platelets in the supernatant. After that, the plasma that contains the platelets is transferred to a sterile tube and centrifuged once more, but this

time at a higher speed (referred to as a "hard spin" – 3200rpm for 10min) in order to extract the platelet concentrate. PRP and platelet-poor plasma (PPP) are both created at this step of the process. PRP is the lower part of the platelet concentrate, while PPP has the top part. [43]

Buffy Coat Method

Before centrifugation, the whole blood must first be kept at a temperature that is slightly below room temperature (between 20 and 24 degrees Celsius). The formation of three layers occurs because of high-speed centrifugation of the whole blood sample. These layers are as follows: a superficial layer, also known as the PPP, an intermediate layer, also known as the "buffy coat" (WBCs and platelets), and a deep layer that is composed of RBCs. After that, the buffy coat is removed and centrifuged at a slower speed, which ends up producing a layer of platelet-rich plasma (PRP), which is then separated from the solution that was produced.[43,44]

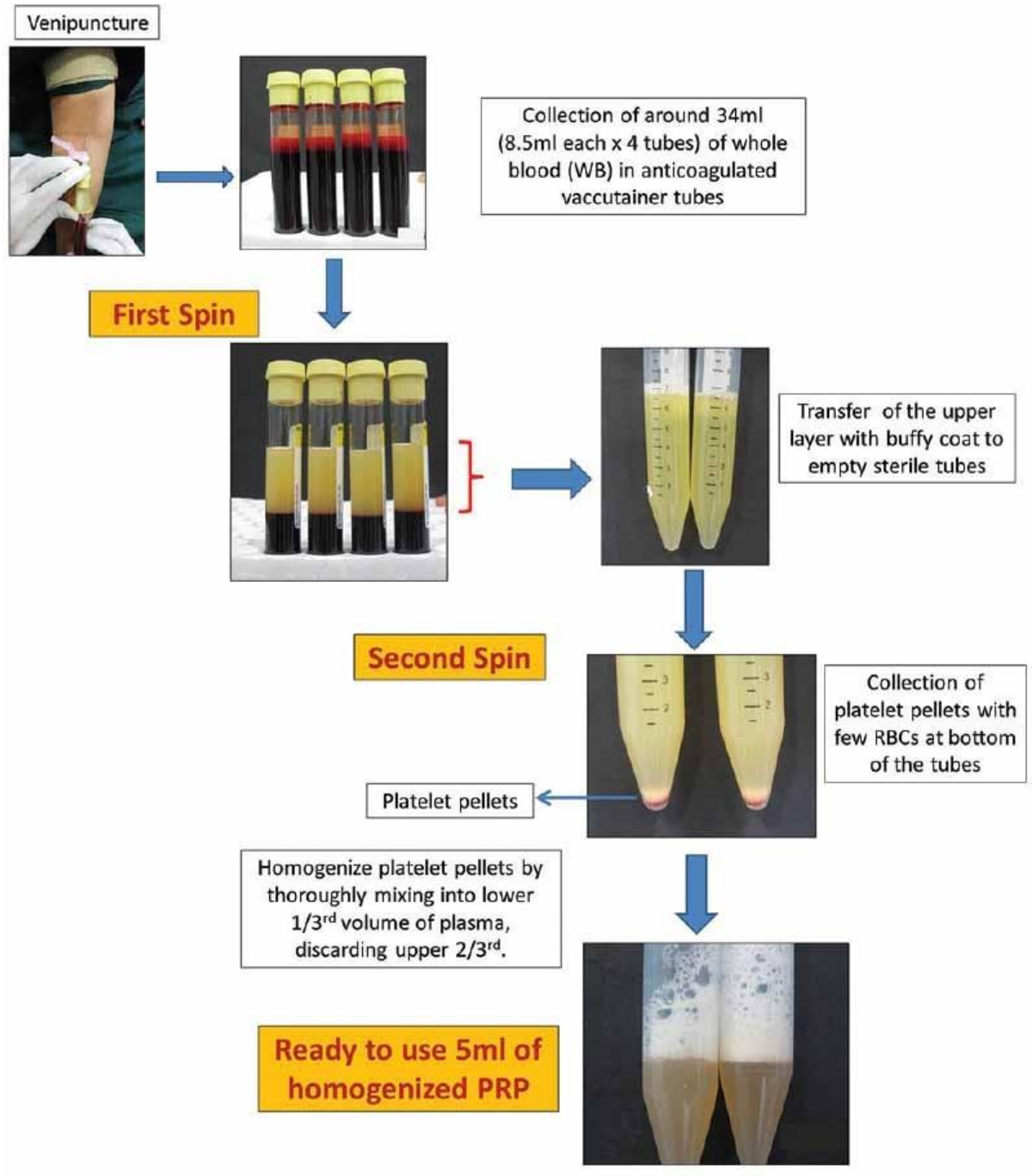

Figure 6: Flowchart describing preparation of PRP[43]

Platelet-rich plasma efficiency in LBP and LR pain treatment.

Although orthobiologic treatments are increasingly being used in orthopaedics, particularly for SI pain, facet arthropathy, and LBP caused by disc degeneration, there have been minimal investigations on the use of Epidural Platelet-Rich Plasma Injection (EPRPI) LR for LRP. [45] Disc degeneration is responsible for causing LBP. Several clinical trials have demonstrated the effectiveness of intra-discal PRP injections, which possess anti-inflammatory and healing qualities, as a treatment for this problem. [46–48]

For alleviating pain in the SI, Singla et al. (2017) compared the effectiveness of PRP with injectable CS. Findings at the 6-week and 3-month marks demonstrated beneficial benefits. [49] They were surprised to see few short-term adverse effects in the EPRPI, but after 2 weeks, the ESI group had a greater percentage of pain reduction {≥ 50% on the Visual Analogue Scale (VAS), scale} than the PRP group. Wu et al. also found that PRP was effective in the long run in alleviating facet arthropathy pain. Compared to the CS group, the PRP group had better recovery at long term (3–6 months), according to the study. Having said that, it should be noted that in short term (1 month), the CS group did better than the PRP group. [33]

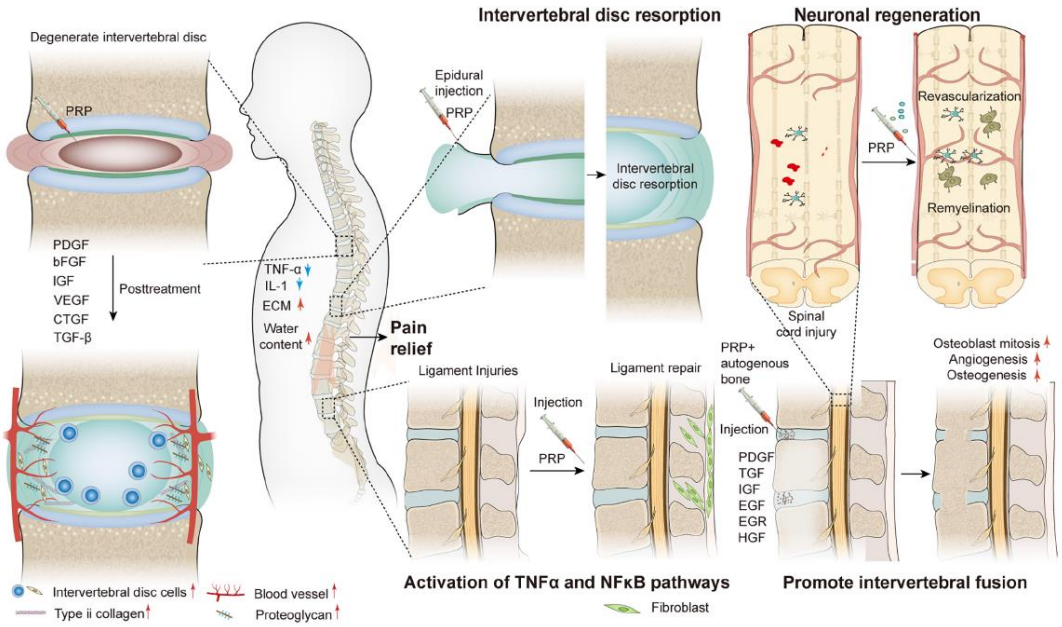

Figure 7: Schematic diagram of PRP in the treatment of spine-related diseases.[50]

PRP injections are used to treat disco-radicular impingement because of its capacity to increase healing and trigger inflammation. This is achieved by directly administering platelet concentrations that are at least three times higher than the normal blood concentration of the patient to the site of impingement. Plaque RBCs can be processed more easily, yielding a platelet concentrate with 50–80 alpha granules and over 30 active proteins and peptides, such as growth factors and anti-inflammatory cytokines. The injection is administered within a time frame of fewer than 30 minutes after the centrifugation process has concluded. Platelets aggregate and form a clot within 10 minutes after the external injection of PRP into the impingement site, and almost all of the alpha-granule content is released within 1 hour. [36] Leukocyte deficient PRP can

effectively reduce catabolic and inflammatory processes associated with leucocytes. [51] Studies on LRP have also concentrated on platelet lysates, which are a kind of PRP. [52]

Moreover, aside from its anti-inflammatory properties, numerous studies have documented that PRP also contributes positively to the healing of nerve injuries and the alleviation of neuropathic pain. [53,54]

Differential Diagnosis for LDHR[29]

- Infective spondylodiscitis: Patient will have fever, weight loss, loss of appetite
- Inflammatory arthritis: Multiple joint pain and morning stiffness
- Metastatic: Weight loss, loss of appetite and symptoms of primary tumour
- Multiple myeloma: multiple punched out lesions on plain X rays. SPEP (serum protein electrophoresis) M spike present (50% IgG), UPEP (urine protein electrophoresis) may show Bence Jones proteins.
- Ankylosing spondylitis: Gross restriction of spine movements, bamboo spine appearance in plain X ray

REVIEW OF LITERATURE

When it comes to treating lumbar disc herniation with radicular pain, Xu et al. performed a RCT in China by 2021 to compare the safety and effectiveness of steroid injections with ultrasound-guided PRP injections.[11] A study discovered that lumbar disc herniation patients who had transforaminal injections of PRP had similar results to those who received steroid injections. This implies that PRP injections might be a more secure option.

A non-randomized comparison study was carried out by Bise in France by the year 2021 with the purpose of comparing the treatment of persistent LRP with interlaminar CT-guided EPRPI and ESI that had been present for more than six weeks. [45] When it comes to the treatment of chronic LRP, CT-guided interlaminar EPRPI has results that are comparable to those of ESI and may turn out to be a more secure alternative.

In 2016, Wu et al conducted a study in China to assess the efficacy and safety of autologous PRP with LA along with CS in intra-articular injection for treating lumbar facet joint condition. [33] When it comes to treating lumbar facet joint conditions, the researchers discovered that autologous PRP and LA/CS injections for intra-articular usage are sufficiently safe, and effective. However, for more effective and longer-lasting therapy, autologous PRP is

the way to go. In addition, throughout the follow-up period, neither group experienced any treatment-related complications.

Results from a 2014 American systematic review by George et al. comparing transforaminal and interlaminar approaches to ESI for LRP indicated that both methods were. At the 2-week follow-up, TFESI showed a non-clinically significant advantage over ILESI in pain relief. In terms of functional improvement, two trials found that ILESI was better than TFESI, although not in a clinically meaningful way. [31]

The intra-articular PRP injection was determined to be an effective treatment modality in LBP involving the SI in a randomized controlled trial conducted in 2016 in India by Varun Singla et al., which compared CS injections with PRP injections using ultrasound guidance for patients with chronic LBP. [49]

By 2020, Verma et al. will have studied 20 patients in India with chronic prolapsed IVDs to determine the efficacy of PRP in this condition. [55] No problems arose, and patients were free to go about their normal lives without painkillers. Based on the findings of this research, PRP is clearly a promising new approach to treating discogenic back pain; it is also a safe, effective, and practically feasible treatment option.

In order to determine if PRP administered via the interlaminar epidural route effectively relieves pain in individuals suffering from prolapsed IVDs,

Bhatia et al. performed a pilot trial. [56] After reviewing the available options for treating persistent prolapsed intervertebral discs, the researchers concluded that autologous PRP could be a viable substitute for epidural steroids and surgery.

According to a RCT and economic evaluation that was carried out in the United Kingdom in 2021 by Martin John Wilby et al. on surgical microdiscectomy versus ESI, patients who suffer from LRP because of a DH and have symptoms that have lasted for up to a year should be considered for epidural steroid injection as a first invasive treatment option. Steroid injections into the epidural space are likely to be more cost-effective than surgical procedures. [57]

In a 2017 study conducted in the United States by Christopher Centeno and colleagues, the effectiveness of lumbar epidural injection of platelet lysate (PL) for treating LRP was examined. According to the study, patients who got PL epidurals reported significantly less pain, with their functional rating index (FRI) scores exceeding the least clinically relevant difference (MCID). Furthermore, these patients reported subjective improvement in their condition throughout a two-year follow-up period. Polylactic acid (PL) has the capacity to serve as a viable substitute for corticosteroids, demonstrating comparable effectiveness. [52]

In 2015, Bhatia and colleagues conducted a systematic review and meta-analysis in Canada on the effectiveness of TFESI for treating LRP caused by DH. The study found that TFE steroids, particularly at the three-month mark, offer a modest analgesic benefit to patients with LRP caused by DH. Nevertheless, the study revealed that these injections do not impact the intensity of physical impairment or the frequency of surgical interventions. [36]

In the year 2020, 76 individuals suffering from LBP or sciatica participated in a concurrent trial in Jordan, carried out by Kanaan et al. They looked at how well fluoroscopically guided SNRB worked for treating LR in the clinic. [74] The study shows that a 29% of the patients was symptomatically better lasting six months or more with just one SNRB. Because of this, it is a viable option to postpone or even eliminate the necessity for surgery and it is an excellent adjunct to conservative therapy.

In 2020, Viswanathan et al. conducted a review in India based on evidence. The evaluation included 539 publications that covered different aspects of lumbar transforaminal epidural steroid injection. They concluded that SNRB had an effectiveness rate of 76% to 88% overall. The time immediately following injection was when most of the positive effects were felt. [75]

In 2021, 50 patients in India had undergone SNRBs as part of a prospective trial by Hamza Shaikh et al., who monitored them for three

months. [76] Following 3 months of SNRB, the VAS and ODI scores dropped significantly. Because it alleviates leg and back pain and impairment in most patients immediately and for an extended period, they concluded that an SNRB should be administered early on during LR.

Sixty patients hospitalized in India with low back pain from neural foraminal stenosis or ruptured discs were the subjects of a study by Somashekara et al. by the year 2023. After 12 weeks, patients with PIVD and neural foraminal stenosis who had a combination of bupivacaine and triamcinolone injections had less pain and less impairment compared to control group who had bupivacaine injections alone. [77]

Lumbar transforaminal epidural steroid injection (LTFESI) was studied by Dhandapani et al. to determine its effectiveness in alleviating pain and enhancing functional results for patients suffering from LR in India within the year 2023. [78] Results indicated that the NRS pain ratings decreased following the epidural steroid injection after 24 hours, one month, three months and six months after the injection. ODI score also decreased during this period.

Dhakal et al. (2019) performed prospective observational research in Nepal for a year on 35 patients treated with SNRB for LR. The research enrolled patients who had one level of disc prolapse, leg discomfort and a positive straight leg raise test. [79] The study shows decline in VAS Score for 1

year in patients with LR. But after about six months, the pain reduction stops becoming any better. The disability index score drops over the first six months, but then it stays quite stable for the next twelve months.

In 2019, Thakur et al. In his prospective study in Nepal. Included 29 patients who has LR verified by different 3 MRI. The NRS and the MRM were used in a prospective evaluation of the treatment outcome over the 6-month follow-up period. They came to the conclusion that for patients suffering from LR due to a 1 level disc prolapse, SNRB provides an instantaneous alleviation of pain. Even in very active patients, like police officers, it lessens impairment. [80]

Research was carried out in Korea by Sangbong et al. in 2019. The study comprised 233 individuals who had Lumbar foraminal stenosis (LFS). [81] Two, twelve-and twenty-four-weeks following injection, patients undergoing SNRBs had their symptoms evaluated for improvement. They found that after 2 weeks, SNRB decreased pain by 51% in LFS patients. Individuals with LFS grades 1T, 2, or 3 had better outcomes after 12 weeks on SNRBs than individuals with grade 1V.

To determine which patients would benefit most from lumbar decompression surgery and to evaluate the predictive validity of SNRBs, Beynon et al. performed a systematic evaluation in the UK in 2019. [82] They conclude that SNRB is a risk-free test with minimal potential for serious

problems, but it is still debatable whether the extra diagnostic data it yields is worth the price.

A prospective cohort study done by Marinella Gugliotta et al in the year 2016, regarding surgical versus conservative treatment for LDH. The study concluded that surgical treatment gives faster relief to LBP, but over longer follow-up there was no difference between conservative management. [83]

MATERIALS AND METHODS

STUDY DESIGN:

A prospective, open labelled, comparative randomised control trial.

STUDY AREA:

The study focused on patients with LDHR who were admitted to the emergency medical department and the Orthopaedics department of RL Jalappa hospital in Kolar.

STUDY PERIOD AND DURATION:

The study was done from September 2022 to December 2023, which spanned a duration of one year and four months.

STUDY POPULATION:

All patients diagnosed with LDHR and admitted in the Orthopaedics ward from the emergency medical department and outpatient department at R.L.Jalappa Hospital and Research Centre, and who meet the inclusion criteria, are included.

SAMPLE SIZE CALCULATION

In the study conducted by Gosens et al., it was discovered that the mean VAS score in the corticosteroid group after 104 weeks was 42.4 ± 26.8, whereas the mean VAS score in the PRP group after 104 weeks was 21.3 ± 28.1. [58] The

sample size was determined using the following formula, with a 95% confidence interval and 90% power.

$N = (Z1-\alpha/2 + Z1-\beta)2 * 2 * \sigma2/ (\mu1 - \mu2)2$

$Z1-\alpha/2$ - two tailed probability for 95% confidence interval = 1.96

$Z1-\beta$ - two tailed probability for 90% power = 1.28

$\mu1$ - mean of VAS score in corticosteroid group at 104 weeks = 42.4

$\mu2$ - mean of VAS score in PRP group at 104 weeks = 21.3

σ - average standard deviation of VAS score in corticosteroid group at 104 weeks & VAS score in PRP group at 104 weeks = 27.45

$N = (1.96 + 1.28) ^2 * 2 * 27.45^2 / (42.4 - 21.3) ^2$

$N = 35.57$

Consequently, a minimum of 48 samples are needed for every group, and a total of 96 samples are needed.

INCLUSION CRITERIA:

- Patients between the ages of 20 and 60, of any gender.
- Chronic LBP with LRP for more than 6 weeks.
- The presence of LDH has been confirmed using MRI, and the findings are in line with the observed clinical symptoms and indicators.

- A patient experiencing persistent pain, regardless of receiving conservative treatment such as physical therapy, manipulation, and non-opioid medication.
- The patient has no prior record of spinal surgery.

EXCLUSION CRITERIA:

- Had previously injectable therapy during the last 3 months, including nerve root injection and caudal injection.
- Patients with spinal tumors, TB, or any neurological disability.
- Multi-segmental lumbar disc herniation refers to the presence of herniated discs in many segments of the lumbar spine. Spinal deformity refers to any abnormal curvature or misalignment of the spine. Spinal stenosis - the narrowing of the spinal canal, which puts pressure on the spinal cord and nerves.
- Not suitable for local injection
- History of oral anticoagulation or drug abuse
- Contraindications for participation in this study include infection, pregnancy, severe diabetes, and allergy to the medicine being investigated.
- Patients with heart, liver and kidney dysfunction, and hematological diseases.

- Psychological and cognitive disorders.

SAMPLING METHOD:

All successive patients diagnosed with lumbar disc herniation radiculopathy from September 2022 to December 2023 and admitted to the Orthopaedics department of RL Jalappa hospital in Kolar.

DATA COLLECTION PROCEDURE

A patient underwent a comprehensive evaluation that included a medical history, physical examination, and imaging tests after they met all inclusion and exclusion criteria. According to the randomization.com, a 4-block randomization procedure, the patients were divided into: Group A and Group B each group consist of 48 patients. Following the acquisition of permission and surgical fitness, patients were administered PRP to group A via transforaminal injection and corticosteroids to group B. Then patient was administered,

In group A PRP: Administer 3 millilitres of autologous PRP using a transforaminal injection.

Group B Steroid: Administer a transforaminal injection of 1 millilitre of Triamcinolone acetonide, with a concentration ranging from 20 to 60 milligrams, along with 2 millilitres of Levobupivacaine at a concentration of 0.25%.

Patients who received a transforaminal injection had a follow-up appointment at 1, 3, and 6 months after the procedure. During the follow-up, each patient was evaluated using the Modified Oswestry low back pain Disability Index (MODI), VAS, Modified Roland Morris sciatica score (MRM), and Core Measures Index (COMI).

Study Tools

- **VAS (Visual Analog Scale)** – It provides a dependable and accurate subjective evaluation for both immediate and prolonged pain. A single handwritten mark positioned at a specific location on a 10-centimeter line signifies a spectrum between the two extremes of the scale. The left end (0 cm) indicates "no pain" while the right end (10 cm) represents the "worst pain". This scale was utilized to document self-reported symptom assessments and compute scores. [59,73]
- **MODI (Modified Oswestry low back pain Disability Index)** – The instrument evaluates functional capacity and pain levels by self-report. As a result of lower back discomfort, it is used to assess the degree of damage.[60] Fairbank et al. developed the original index in 1980, and it is still used today to measure impairment. A patient's disability can be evaluated using the MODI's ten sections. Factors such as pain level, mobility, lifting capability, walking speed, sitting, and standing abilities, sleep quality, effects on social life and travel, and sex life are used to

establish these domains. Each domain has a score between zero and five. After that, we multiply the total score by 2, and we get a MODI score between zero and one hundred. A more severe disability is indicated by a higher MODI score. [61]

- **Modified Roland Morris sciatica score (MRM)** - The 24-item outcome measure assesses the extent of disability resulting from pain specifically related to low back pain. The MRM score ranges from zero to twenty-four, with higher scores indicating greater pain-related disability. Items are scored as zero if not indicated and one if indicated. [62]
- **COMI (Core Outcome Measures Index)** – Its purpose was to assess the multifaceted effects of LBP. [63] The assessment includes a set of inquiries that address various aspects such as pain intensity in the back and leg/buttock, measured individually on a numeric scale ranging from 0 to 10. Additionally, it assesses the function of the back, the well-being of specific symptoms, overall quality of life, social disability, and work disability, all of which are given a 5-point rating. The COMI-back composite score runs from 0 to 10, with higher values indicating a more negative consequence. [64,65]

ETHICAL CONSIDERATION

The Institutional Ethics Committee has granted its ethical approval – No.SDUMC/KLR/IEC/308/2022-23. The researchers ensured the participants' privacy and confidentiality by strictly utilizing the acquired data solely for the specified research objectives.

DATA ANALYSIS

- The collected data were imported into Microsoft Excel and subsequently analysed by IBM. The program used for statistical analysis is SPSS 23.0.
- We employed frequency analysis and percentage analysis to apply descriptive statistics for discrete variables to characterize the data. The statistical measures used for continuous data were standard deviation, median, and mean.
- Using the Paired T test, we compared the two groups' pre- and post-PRP scores on the VAS, MODI, MRM, and COMI at different intervals to see any statistically significance.
- We used the Independent T test to look at the differences in VAS, MODI, MRM, and COMI scores to see if there was a significance between the two groups at different evaluation intervals.
- A significance level of 0.05 was used in all statistical approaches.

RESULTS

The mean age of the lumbar disc herniation radiculopathy (LDHR) patients in PRP group was 40.75 ± 10.8 years and the mean age of the LDHR patients in Steroid group was 43.52 ± 8.9 years. About 54.2% of the LDHR patients were male in PRP group, and the remaining 45.2% were female. Similarly, 52.1% of the LDHR patients were male in steroid group, and the remaining 47.9% were female.

Table 4: Comparison of age variation among the research groups

Measures of age	PRP	Steroid
Mean	40.75	43.52
Median	39	45
Std. Deviation	10.828	8.923
Range	39	46
Minimum	21	21
Maximum	60	67

In the PRP group, the average age of the LDHR patients was 40.75 ± 10.8 years, while in the Steroid group, it was 43.52 ± 8.9 years.

Table 5: Gender differences between the study groups compared

Gender	PRP		Steroid	
	n	%	n	%
Female	22	45.8	23	47.9
Male	26	54.2	25	52.1
Total	48	100	48	100

About 54.2% of the LDHR patients were male in PRP group, and the remaining 45.2% were female. Similarly, 52.1% of the LDHR patients were male in steroid group, and the remaining 47.9% were female.

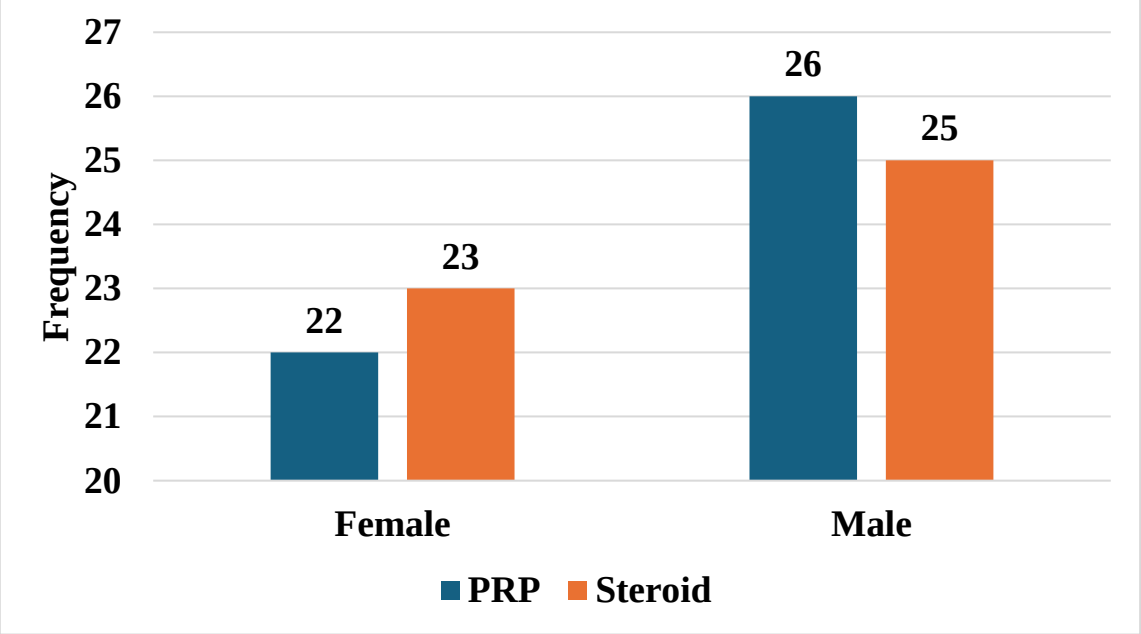

Figure 8: A multi-bar graphic illustrating the gender disparity among the study groups.

Table 6: Comparative analysis of the difference in the historical occurrences of radiculopathy among the study cohorts

Radiculopathy	PRP		Steroid	
	n	%	n	%
Bilateral	22	45.8	11	22.9
Left	9	18.8	18	37.5
Right	17	35.4	19	39.6
Total	48	100	48	100

PRP group: Bilateral radiculopathy was observed in 45.8% of the LDHR patients, right side radiculopathy was observed in 35.4% of the LDHR patients while left side radiculopathy was observed in only 18.8% of the LDHR patients.

Steroid group: Bilateral radiculopathy was observed in only 22.9% of the LDHR patients, right side radiculopathy was observed in 39.6% of the LDHR patients while left side radiculopathy was observed in 37.5% of the LDHR patients.

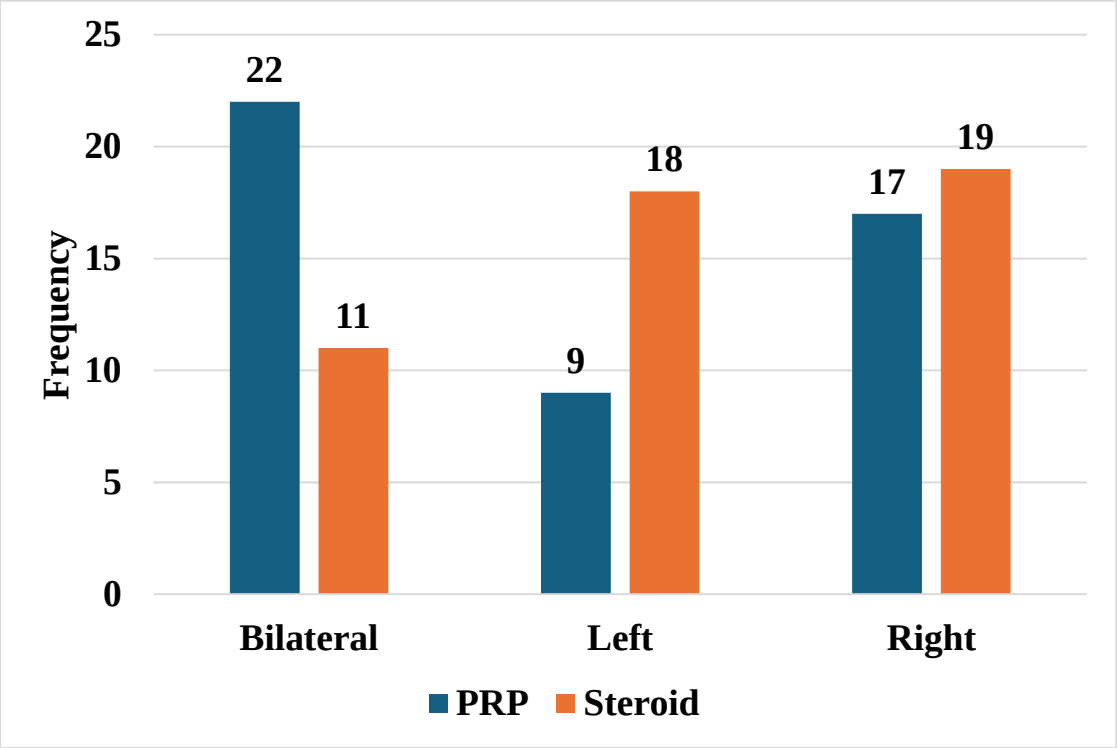

Figure 9: A multiple bar chart illustrating the disparity in the occurrence of radiculopathy among the various study groups.

Table 7: Comparison of VAS scores at various evaluation time points between the two study groups.

VAS score	Preprocedural	1month	3 months	6 months
PRP				
Mean	6.65	5.17	3.27	1.65
Median	7.00	5.00	3.00	2.00
Std. Deviation	.526	.663	.644	.483
Range	2	2	2	1
Minimum	5	4	3	1
Maximum	7	6	5	2
Steroid				
Mean	6.81	3.85	2.75	2.13
Median	7.00	4.00	3.00	2.00
Std. Deviation	.607	.652	.526	.489
Range	3	3	3	2
Minimum	4	2	1	1
Maximum	7	5	4	3

The table above displays the mean VAS score that was measured at various time intervals before and after the procedure in the management of LDHR

patients. The pain score was 6.65 prior to the PRP injection, but it decreased to 5.17 after one month. Subsequently, the pain score experienced an additional decline at three months (3.27), and a significant decline at six months (1.65), all of which occurred after the PRP injection. Following PRP injection, patients with LDHR consistently experienced a decrease in their pain score.

The pain score was 6.81 prior to the steroid injection, but it decreased to 3.85 after one month. Subsequently, the pain score experienced an additional decline at three months (2.75), and a significant decline at six months (2.31), all of which occurred after the steroid injection. Following steroid injection, the pain score for LDHR patients consistently decreased.

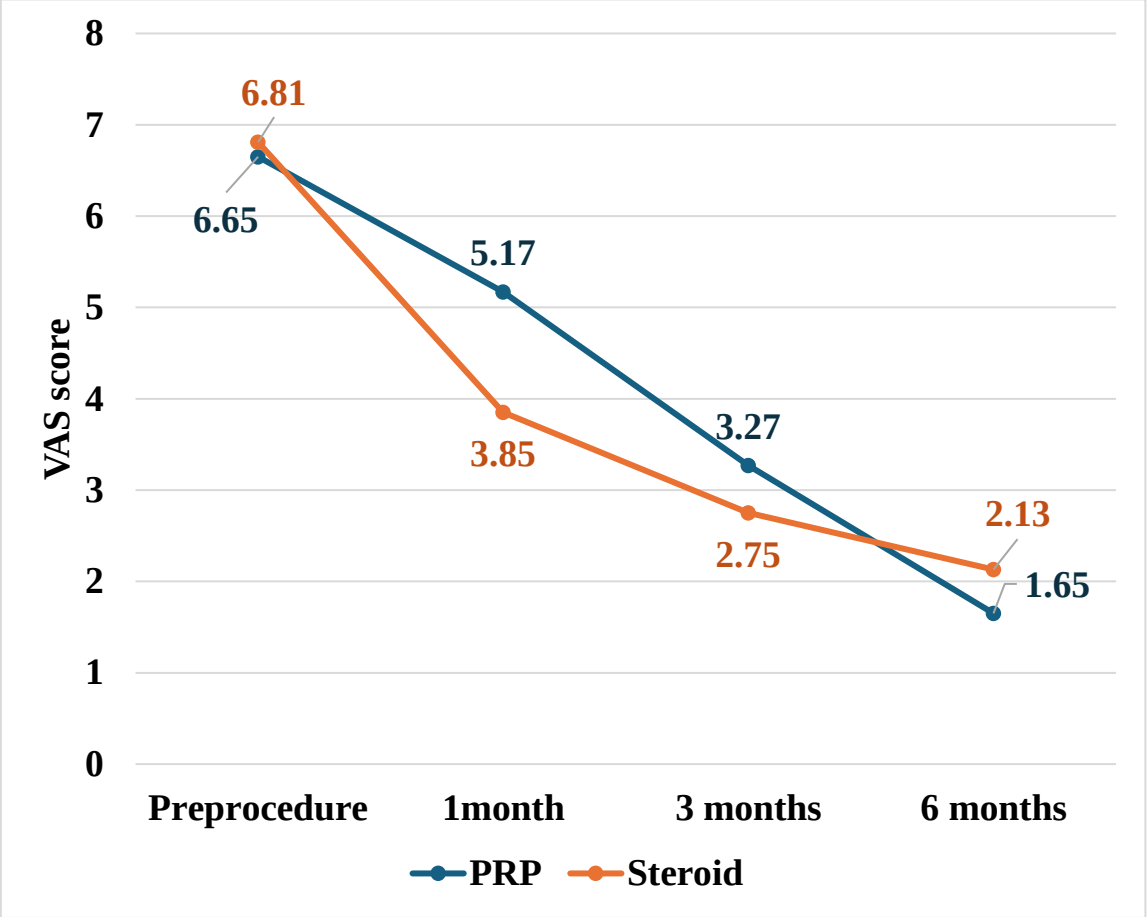

Figure 10: Line diagram illustrating the average VAS score at various evaluation times for both research groups.

Table 8: Comparison of MODI scores at various assessment times between the two study groups.

MODI score	Preprocedural	1month	3 months	6 months
PRP				
Mean	53.69	42.67	19.75	11.35
Median	55	44	20	11
Std. Deviation	5.582	4.724	3.028	1.407
Range	22	21	13	5
Minimum	40	30	15	9
Maximum	62	51	28	14
Steroid				
Mean	55.98	35.13	25.25	18.04
Median	58	35.5	25	18
Std. Deviation	5.114	5.999	6.309	3.115
Range	24	38	34	15
Minimum	40	18	2	9
Maximum	64	56	36	24

The table above displays the mean MODI score that was measured at various time intervals before and after the PRP and CS injection in the management of LDHR patients. MODI score was 53.69 prior to the PRP injection, but it decreased to 42.67 after one month. Subsequently, the disability score experienced an additional decline at three months (19.75), and a significant decline at six months (11.35), all of which occurred after the PRP injection. After receiving PRP injections, LDHR patient's MODI disability scores consistently decreased.

The disability score (MODI) was 55.98 prior to the steroid injection, but it decreased to 35.13 after one month. Subsequently, the disability score experienced an additional decline at three months (25.25), and a significant decline at six months (18.04), all of which occurred after the steroid injection. Following steroid injection, the MODI disability score of LDHR patients consistently decreased.

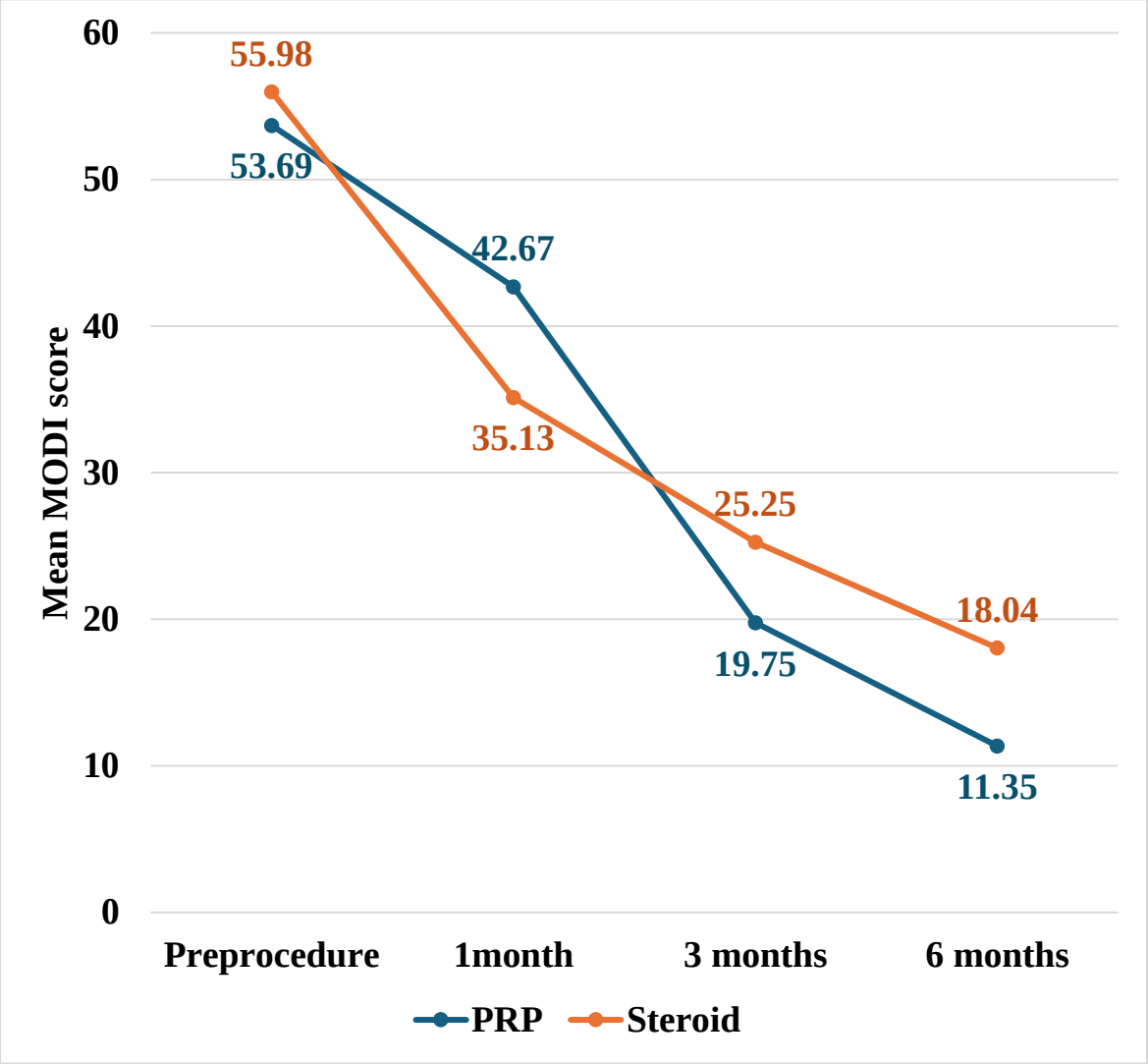

Figure 11: Line diagram illustrating the average MODI score at various assessment times for both research groups.

Table 9: Comparison of COMI scores at different time points in both research groups.

COMI score	Preprocedural	1month	3 months	6 months
PRP				
Mean	6.631	5.354	3.383	1.315
Median	6.75	5.8	3.3	1
Std. Deviation	1.232	1.009	0.838	0.467
Range	3	3.4	2.6	1
Minimum	5	3.8	2.2	1
Maximum	8	7.2	4.8	2
Steroid				
Mean	7.165	4.301	3.675	3.081
Median	6.9	3.3	2.6	1.95
Std. Deviation	1.592	6.596	7.572	8.986
Range	12.25	46.8	54	63.8
Minimum	3.95	2.2	1	0.2
Maximum	16.2	49	55	64

The table above displays the mean COMI score that was measured at various time intervals before and after the PRP and CS injection in the management of LDHR patients. COMI score was 6.631 prior to the PRP injection, but it decreased to 5.354 after one month. Subsequently, the outcome score experienced an additional decline at three months (3.383), and a significant decline at six months (1.315), all of which occurred after the PRP injection. In the treatment of LDHR patients, there was a consistent reduction in COMI outcome score after PRP injection.

The outcome score (COMI) was 7.165 prior to the steroid injection, but it decreased to 4.301 after one month. Subsequently, the outcome score experienced an additional decline at three months (3.675), and a significant decline at six months (3.081), all of which occurred after the steroid injection. In the treatment of LDHR patients, there was a consistent reduction in COMI outcome score after steroid injection.

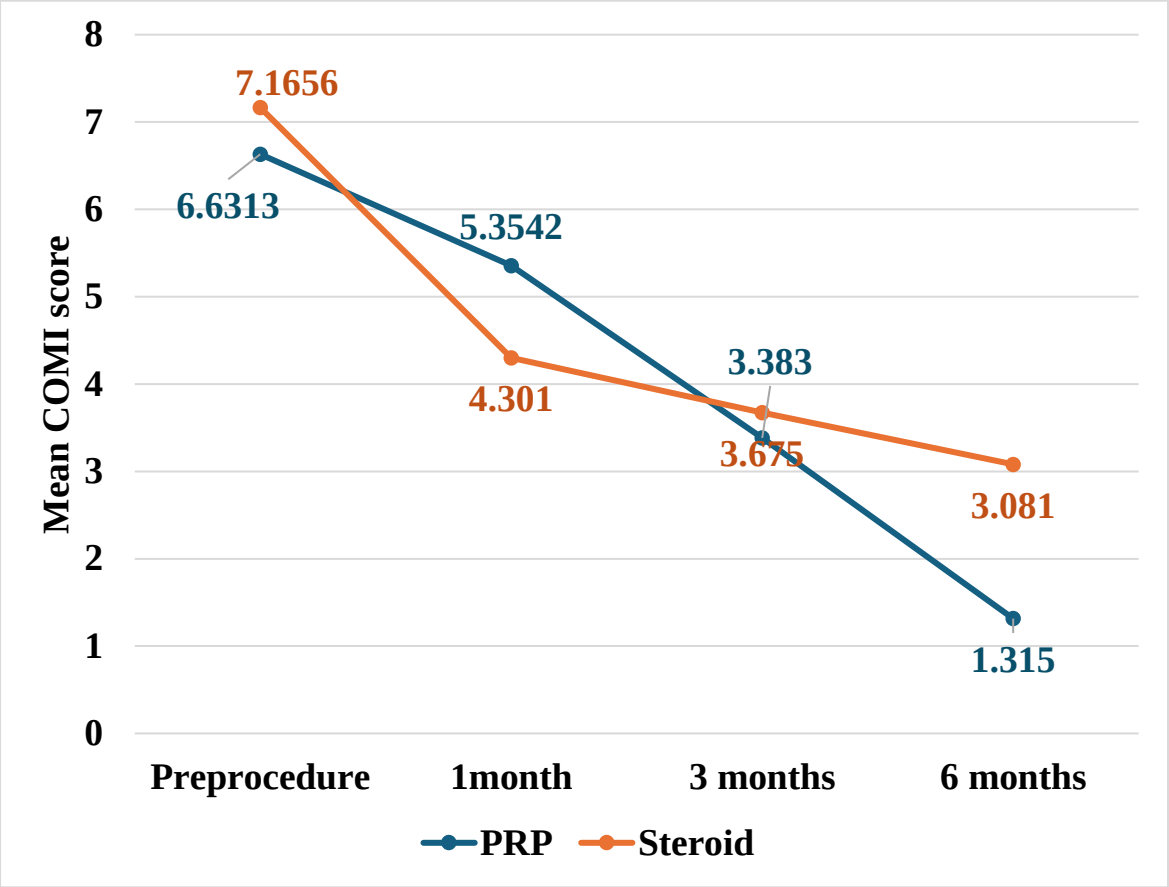

Figure 12: Line diagram illustrating the average COMI score at various evaluation times for both research groups.

Table 10: Comparison of MRM scores at various time points between the two study groups.

MRM score	Preprocedural	1month	3 months	6 months
PRP				
Mean	19.477	24.287	58.7521	86.313
Median	20.1	25	58	86.3
Std. Deviation	3.8873	4.7725	3.63716	2.2881
Range	11.7	21.7	23	11.3
Minimum	14.3	14.3	45	78
Maximum	26	36	68	89.3
Steroid				
Mean	24.438	50.773	61.3879	67.523
Median	20.15	50	61.1	65.3
Std. Deviation	12.6528	10.2374	6.97101	5.6114
Range	45	46	29	26.3
Minimum	12	26	50	61
Maximum	57	72	79	87.3

The table above displays the mean MRM score that was measured at various time intervals before and after the PRP and steroid injection in the management of LDHR patients. The pain related disability score (MRM) was 19.47 prior to the PRP injection, but it increased to 24.28 after one month. Subsequently, the pain related disability score experienced an additional increase at three months (58.75), and a significant incline at six months (86.31), all of which occurred after the PRP injection. In the treatment of LDHR patients, there was a consistent increase in MRM pain related disability score after PRP injection.

The pain related disability score (MRM) was 24.43 prior to the steroid injection, but it increased to 50.77 after one month. Subsequently, the pain related disability score experienced an additional increase at three months (61.38), and a significant incline at six months (67.52), all of which occurred after the steroid injection. Following steroid injection, the MRM pain-related disability score of LDHR patients consistently improved.

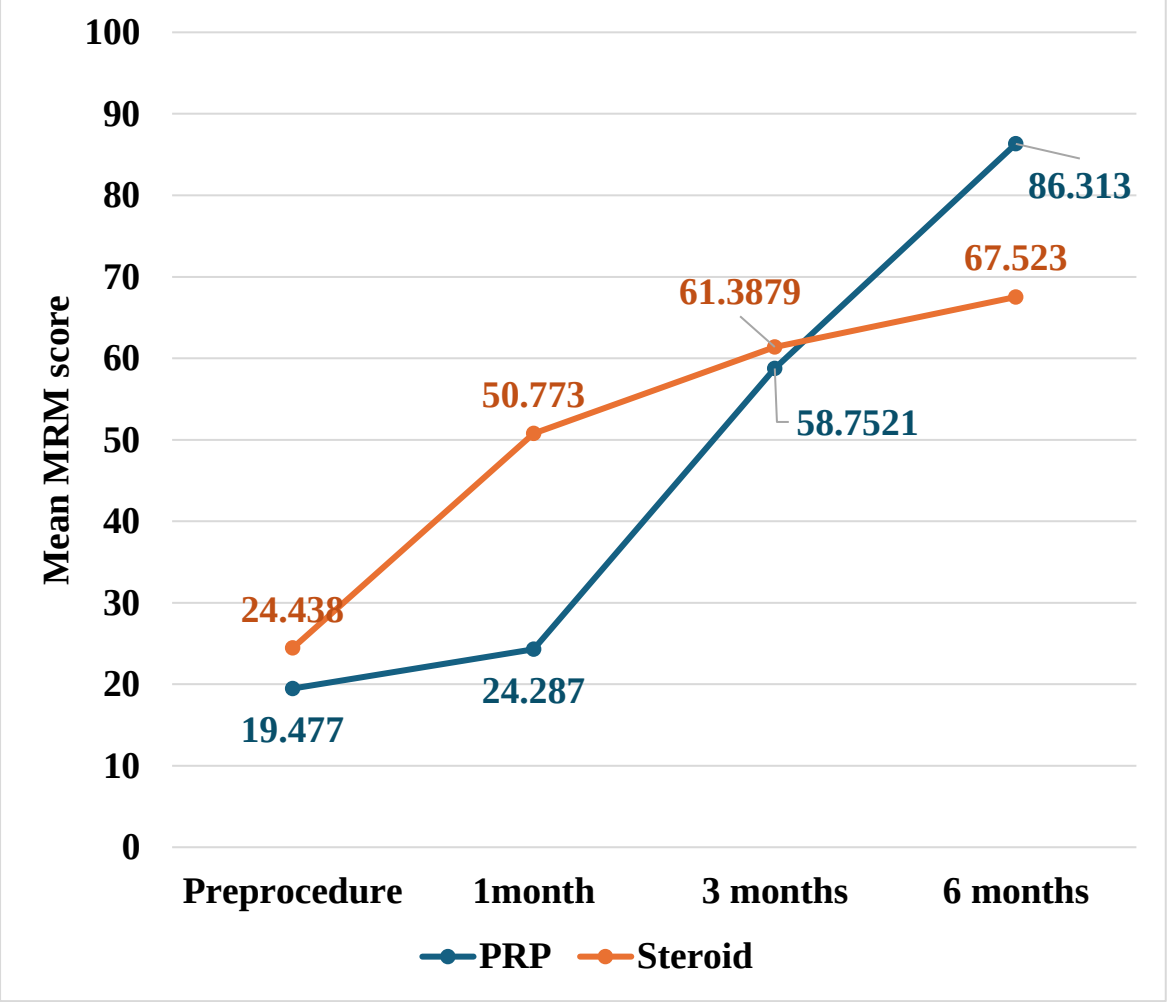

Figure 13: Line diagram illustrating the average MRM score at various evaluation times for both research groups.

Table 11: Comparison of the differences in VAS score prior to and following the procedure in both study groups at 1 month, 3 months, and 6 months using the Paired T test.

VAS score			Mean	Std. Dev	Mean diff.	P value
PRP	Pair 1	Preprocedural	6.65	0.526	1.479	0.0001
		1month	5.17	0.663		
	Pair 2	Preprocedural	6.65	0.526	3.375	0.0001
		3 months	3.27	0.644		
	Pair 3	Preprocedural	6.65	0.526	5.000	0.0001
		6 months	1.65	0.483		
Steroid	Pair 1	Preprocedural	6.81	0.607	2.958	0.0001
		1month	3.85	0.652		
	Pair 2	Preprocedural	6.81	0.607	4.063	0.0001
		3 months	2.75	0.526		
	Pair 3	Preprocedural	6.81	0.607	4.688	0.0001
		6 months	2.13	0.489		

The above table shows the comparison of differences in pain score before and after the procedure in both the study groups at 1 month, 3 months, and 6 months by Paired T test. Prior to PRP injection, the mean pain score was 6.65; after one month, it dropped to 5.17. The Paired T test indicated that this difference in mean pain score as determined by the VAS was P = 0.0001 (statistically significant). The mean VAS score before PRP injection was 6.65 and it decreased to 3.27 at 3 months and this difference in mean pain score as measured by VAS was P = 0.0001 (statistically significant) by Paired T test. The mean pain score before PRP injection was 6.65 and it decreased to 1.65 at 6 months and this difference in mean pain score as measured by VAS was P = 0.0001 (statistically significant) by Paired T test.

Prior to the steroid injection, the mean pain score was 6.81; after one month, it dropped to 3.85. The Paired T test indicated that this change in mean pain score as determined by the VAS was P = 0.0001 (statistically significant). The mean VAS score before steroid injection was 6.65 and it decreased to 2.75 at 3 months and this difference in mean pain score as measured by VAS was P = 0.0001 (statistically significant) by Paired T test. The mean pain score before steroid injection was 6.65 and it decreased to 2.13 at 6 months and this difference in mean pain score as measured by VAS was P value 0.0001 (statistically significant) by Paired T test.

Table 12: Paired T tests were used to compare the differences in MODI scores before and after the procedure in both study groups at 1 month, 3 months, and 6 months.

MODI score			Mean	Std. Dev	Mean diff.	P value
PRP	Pair 1	Preprocedural	53.69	5.582	11.021	0.0001
		1month	42.67	4.724		
	Pair 2	Preprocedural	53.69	5.582	33.938	0.0001
		3 months	19.75	3.028		
	Pair 3	Preprocedural	53.69	5.582	42.333	0.0001
		6 months	11.35	1.407		
Steroid	Pair 1	Preprocedural	55.98	5.114	20.854	0.0001
		1month	35.13	5.999		
	Pair 2	Preprocedural	55.98	5.114	30.729	0.0001
		3 months	25.25	6.309		
	Pair 3	Preprocedural	55.98	5.114	37.938	0.0001
		6 months	18.04	3.115		

The above table shows the comparison of differences in disability score before and after the procedure in both the study groups at 1 month, 3 months, and 6 months by Paired T test. The mean disability score before PRP injection was 53.69 and it decreased to 42.67 at 1 month and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test. The mean disability score before PRP injection was 53.69 and it decreased to 19.75 at 3 months and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test. The mean disability score before PRP injection was 53.69 and it decreased to 11.35 at 6 months and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test.

The mean disability score before steroid injection was 55.98 and it decreased to 35.13 at 1 month and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test. The mean disability score before steroid injection was 55.98 and it decreased to 25.25 at 3 months and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test. The mean disability score before steroid injection was 55.98 and it decreased to 18.04 at 6 months and this difference in mean disability score as measured by MODI was P = 0.0001 (statistically significant) by Paired T test.

Table 13: The study aims to compare the differences in COMI scores before and after the procedure in both study groups at 1 month, 3 months, and 6 months using the Paired T test.

COMI score			Mean	Std. Dev	Mean diff.	P value
PRP	Pair 1	Preprocedural	6.6312	1.23274	1.277	0.0001
		1month	5.3542	1.00973		
	Pair 2	Preprocedural	6.6312	1.23274	3.247	0.0001
		3 months	3.383	0.8388		
	Pair 3	Preprocedural	6.6312	1.23274	5.316	0.0001
		6 months	1.315	0.4672		
Steroid	Pair 1	Preprocedural	7.1656	1.59231	2.864	0.001
		1month	4.301	6.59621		
	Pair 2	Preprocedural	7.1656	1.59231	3.49	0.0001
		3 months	3.675	7.5724		
	Pair 3	Preprocedural	7.1656	1.59231	4.084	0.001
		6 months	3.081	8.9865		

The above table shows the comparison of differences in outcome score before and after the procedure in both the study groups at 1 month, 3 months, and 6 months by Paired T test. Prior to PRP injection, the mean outcome score was 6.63; after one month, it dropped to 5.35. The Paired T test indicated that this difference in mean outcome score, as determined by COMI, was P = 0.0001 (statistically significant). The mean outcome score before PRP injection was 6.63 and it decreased to 3.83 at 3 months and this difference in mean outcome score as measured by COMI was P = 0.0001 (statistically significant) by Paired T test. The mean outcome score before PRP injection was 6.63 and it decreased to 1.315 at 6 months and this difference in mean outcome score as measured by COMI was P = 0.0001 (statistically significant) by Paired T test.

The mean outcome score before steroid injection was 7.16 and it decreased to 4.30 at 1 month and this difference in mean outcome score as measured by COMI was P = 0.0001 (statistically significant) by Paired T test. The mean outcome score before steroid injection was 7.16 and it decreased to 3.67 at 3 months and this difference in mean outcome score as measured by COMI was P = 0.0001 (statistically significant) by Paired T test. The mean outcome score before steroid injection was 7.16 and it decreased to 3.08 at 6 months and this difference in mean outcome score as measured by COMI was P = 0.0001 (statistically significant) by Paired T test.

Table 14: Paired T tests were used to compare the differences in MRM scores before and after the procedure in both study groups at 1 month, 3 months, and 6 months.

MRM score			Mean	Std. Dev	Mean diff.	P value
PRP	Pair 1	Preprocedural	19.477	3.8873	-4.81	0.0001
		1month	24.287	4.7725		
	Pair 2	Preprocedural	19.477	3.8873	-39.275	0.0001
		3 months	58.7521	3.63716		
	Pair 3	Preprocedural	19.477	3.8873	-66.835	0.0001
		6 months	86.313	2.2881		
Steroid	Pair 1	Preprocedural	24.438	12.6528	-26.335	0.0001
		1month	50.773	10.2374		
	Pair 2	Preprocedural	24.438	12.6528	-36.95	0.0001
		3 months	61.3879	6.97101		
	Pair 3	Preprocedural	24.438	12.6528	-43.085	0.0001
		6 months	67.523	5.6114		

The mean score before PRP injection was 19.47 and it increased to 24.28 at 1 month and this difference in mean score as measured by MRM was P = 0.0001 (statistically significant) by Paired T test. The mean score before PRP injection was 19.47 and it increased to 58.75 at 3 months and this difference in score as measured by MRM was P = 0.0001 (statistically significant) by Paired T test. The mean score before PRP injection was 19.47 and it increased to 86.31 at 6 months and this difference in mean score as measured by MRM was P = 0.0001 (statistically significant) by Paired T test.

The mean pain related disability score before steroid injection was 24.43 and it increased to 50.77 at 1 month and this difference in score as measured by MRM was P = 0.0001 (statistically significant) by Paired T. The mean score before steroid injection was 24.43 and it increased to 61.38 at 3 months and this difference in mean pain related disability score as measured by MRM was P = 0.0001 (statistically significant) by Paired T test. The mean score before steroid injection was 24.43 and it increased to 67.52 at 6 months and this difference in score as measured by MRM was P = 0.0001 (statistically significant) by Paired T test.

Table 15: The VAS scores of the study groups were compared before and after the procedure at 1 month, 3 months, and 6 months using an Independent T test to identify any differences.

VAS score		Mean	Std. Dev	Mean diff.	P value
Preprocedural	PRP	6.65	0.526	-0.167	0.0001
	Steroid	6.81	0.607		
1 month	PRP	5.17	0.663	1.313	0.0001
	Steroid	3.85	0.652		
3 months	PRP	3.27	0.644	0.521	0.0001
	Steroid	2.75	0.526		
6 months	PRP	1.65	0.483	-0.479	0.0001
	Steroid	2.13	0.489		

The above table shows the comparison of differences in pain score between the study groups before and after the procedure at 1 month, 3 months, and 6 months by Independent T test.

Prior to the injection, the average pain score for the PRP group was 6.65, whereas the average pain score for the steroid group was 6.81. This difference in VAS score before the injection between the two study groups was P = 0.0001 (statistically significant) by Independent T test.

A month following the injection, the PRP group have an average pain level of 5.17, whereas the CS group have an average pain score of 3.85. This difference in pain score at 1 month after the injection between the two study groups was P = 0.0001 (statistically significant) by Independent T test.

After three months following the injection, the mean VAS score in the PRP group was 3.27, whereas the mean pain score in the steroid group was 2.75. This difference in pain score at 3 months after the injection between the two study groups was P = 0.0001 (statistically significant) by Independent T test.

The PRP group experienced an average VAS score of 1.65 six months following injection, whereas the CS group experienced an average pain score of 2.13 months following injection. This difference in pain score at 6 months after the injection between the two study groups was P = 0.0001 (statistically significant) by Independent T test.

According to the aforementioned results, PRP was superior to steroids in lowering perceived pain (VAS) over the long run (6 months), but steroids were superior to PRP in lowering VAS over the short term (1 and 3 months).

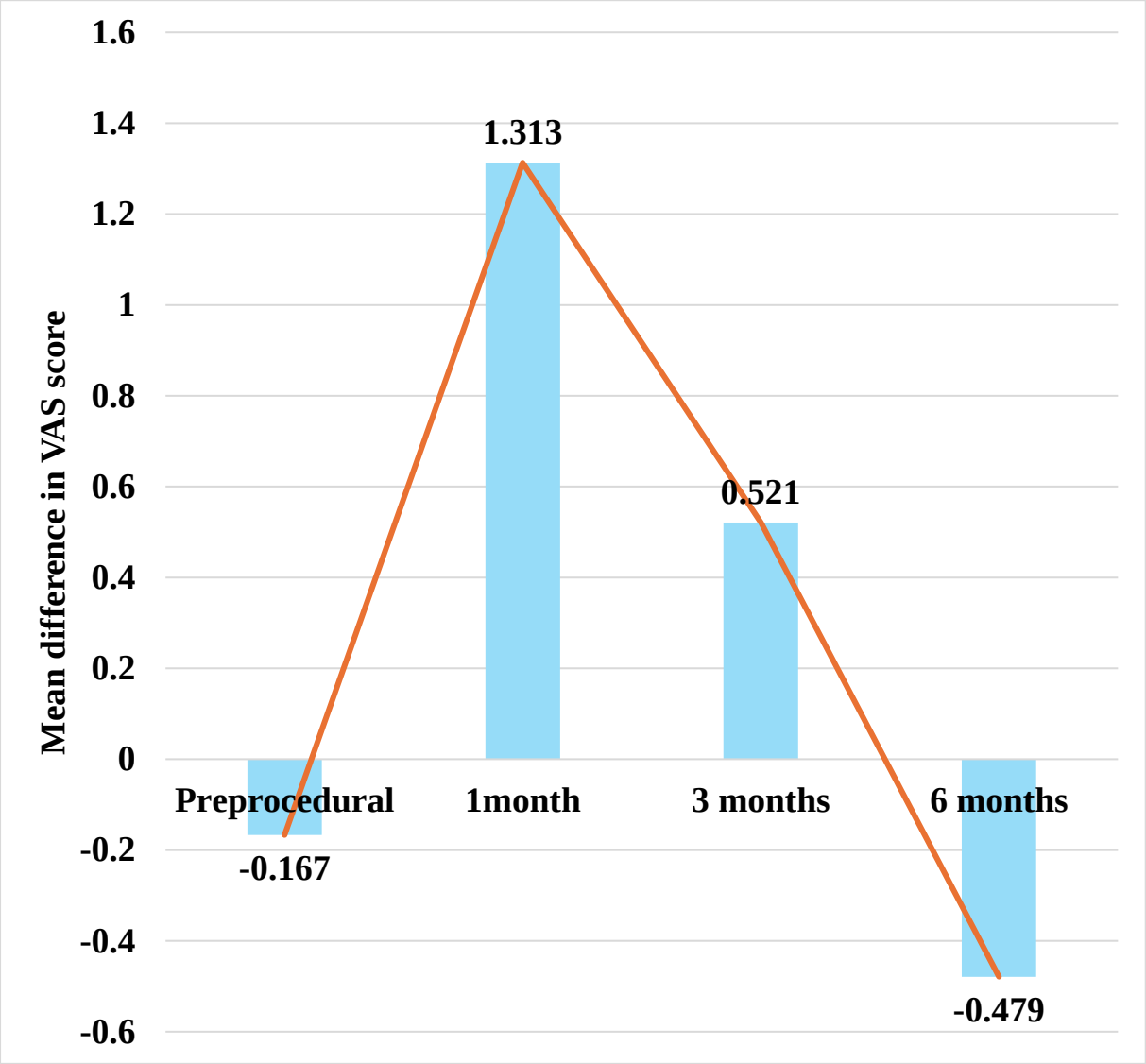

Figure 14: A combination diagram illustrating the variations in VAS score across the study groups prior to and following the procedure at 1 month, 3 months, and 6 months, using an Independent T test.

Table 16: The MODI scores of the study groups were compared before and after the procedure at 1 month, 3 months, and 6 months using an Independent T test to identify any differences.

MODI score		Mean	Std. Dev	Mean diff.	P value
Preprocedural	PRP	53.69	5.582	-2.292	0.039
	Steroid	55.98	5.114		
1 month	PRP	42.67	4.724	7.542	0.0001
	Steroid	35.13	5.999		
3 months	PRP	19.75	3.028	-5.5	0.0001
	Steroid	25.25	6.309		
6 months	PRP	11.35	1.407	-6.688	0.0001
	Steroid	18.04	3.115		

Prior to the injection, the average disability score for the PRP group was 53.69, whereas the average disability score for the steroid group was 55.98. This difference in disability score before the injection between the two study groups was P = 0.039 (statistically significant) by Independent T test.

The mean disability score 1month after the injection in PRP group was 42.67 while the mean disability score 1 month after the injection in steroid group was 35.13. This difference in MODI score between the 2 groups was P=0.0001(statistically significant) by Independent T test.

The mean disability scores 3 month after the injection in PRP group was 19.75 while the mean disability score 3 months after the injection in steroid group was 25.25. This difference in MODI score between the 2 groups was P=0.0001(statistically significant) by Independent T test.

The mean disability scores 6 month after the injection in PRP group was 11.35 while the mean disability score 6 months after the injection in steroid group was 18.04. This difference in MODI score at 6 months after the injection between the two study groups was p = 0.0001 (statistically significant) by Independent T test.

Based on the above findings it was inferred that PRP was better than CS in reducing disability (MODI) at long term (3 and 6 months), whereas steroid was better than PRP in reducing disability at short term (1 month).

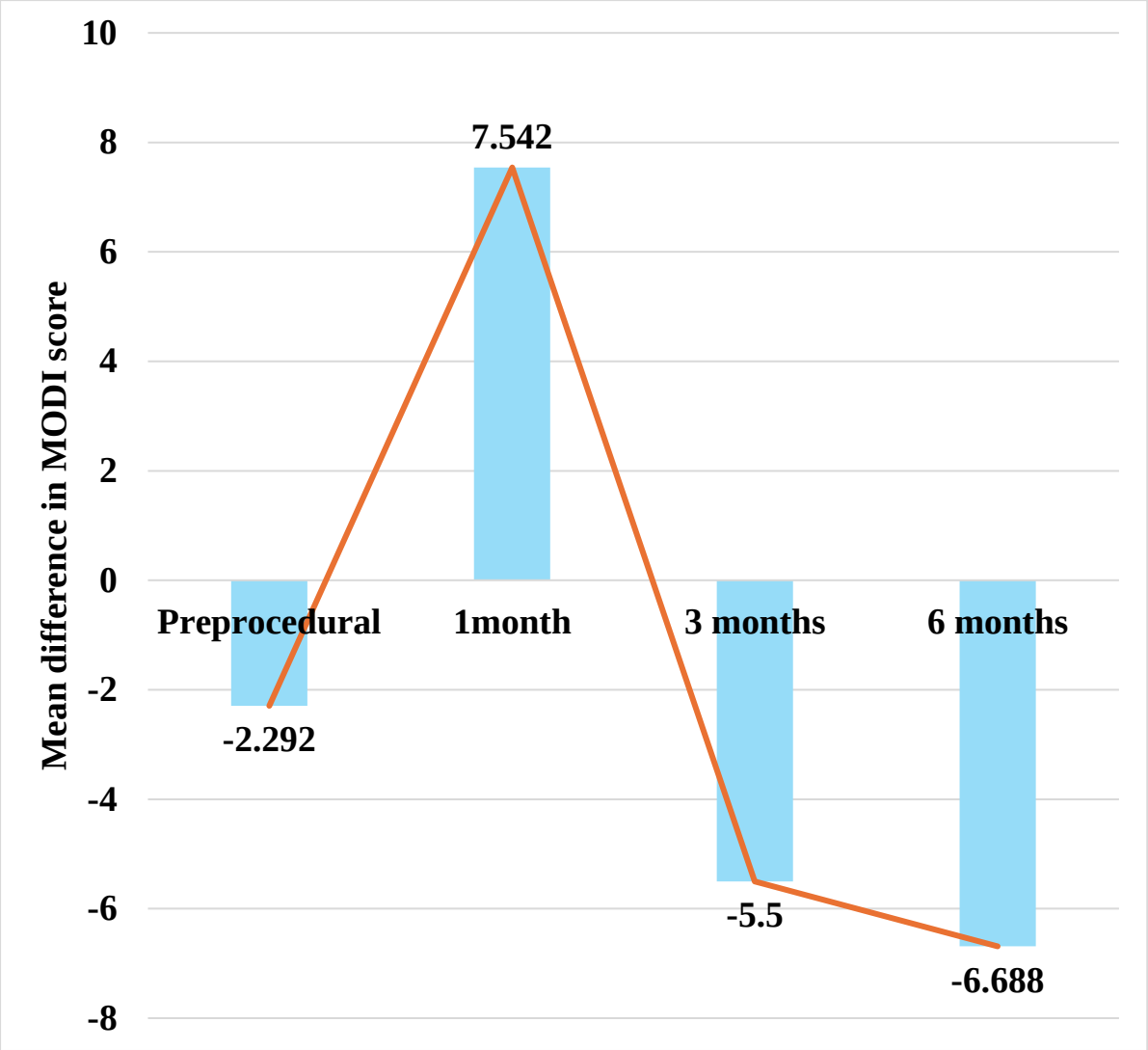

Figure 15: A combination diagram illustrating the disparities in MODI score between the study groups prior to and following the procedure at 1 month, 3 months, and 6 months, using an Independent T test.

Table 17: The study aims to compare differences in COMI score across the study groups prior to and following the surgery at 1 month, 3 months, and 6 months using an Independent T test.

COMI score		Mean	Std. Dev	Mean diff.	P value
Preprocedural	PRP	6.6312	1.23274	-0.53437	0.069
	Steroid	7.1656	1.59231		
1 month	PRP	5.3542	1.00973	1.05313	0.277
	Steroid	4.301	6.59621		
3 months	PRP	3.383	0.8388	-0.2917	0.791
	Steroid	3.675	7.5724		
6 months	PRP	1.315	0.4672	-1.7667	0.177
	Steroid	3.081	8.9865		

Prior to the injection, the average outcome score for the PRP group was 6.63, but the average outcome score for the steroid group was 71.6. This difference in outcome score before the injection between the two study groups was p = 0.069 (statistically significant) by Independent T test.

The mean outcome score 1month after the injection in PRP group was 5.35 while the mean outcome score 1 month after the injection in steroid group was 4.3. This difference in COMI score at 3 months after procedure between the 2 group was P = 0.2777 (statistically not significant) by Independent T.

After three months following injection, the mean result score for the PRP group was 3.38, whereas the mean outcome score for the steroid group was 3.67. This difference in outcome score at 3 months after the procedure between the two study groups was p = 0.791 (statistically not significant) by Independent T.

The mean outcome score 6 months after the injection in the PRP group was 1.315, whereas the mean outcome score in the steroid group was 3.081. This difference in outcome score at 6 months after the injection between the two study groups was p = 0.177m(statistically not significant) by Independent T.

Based on the above findings it was inferred that PRP was better than Steroid in improving outcome (COMI) at long term (6 months), whereas steroid was better than PRP in improving outcome at short term (1 and 3 months). But it was not statistically significant. Hence there was no difference in outcome (measured by COMI) between the PRP and Steroid groups after the injection.

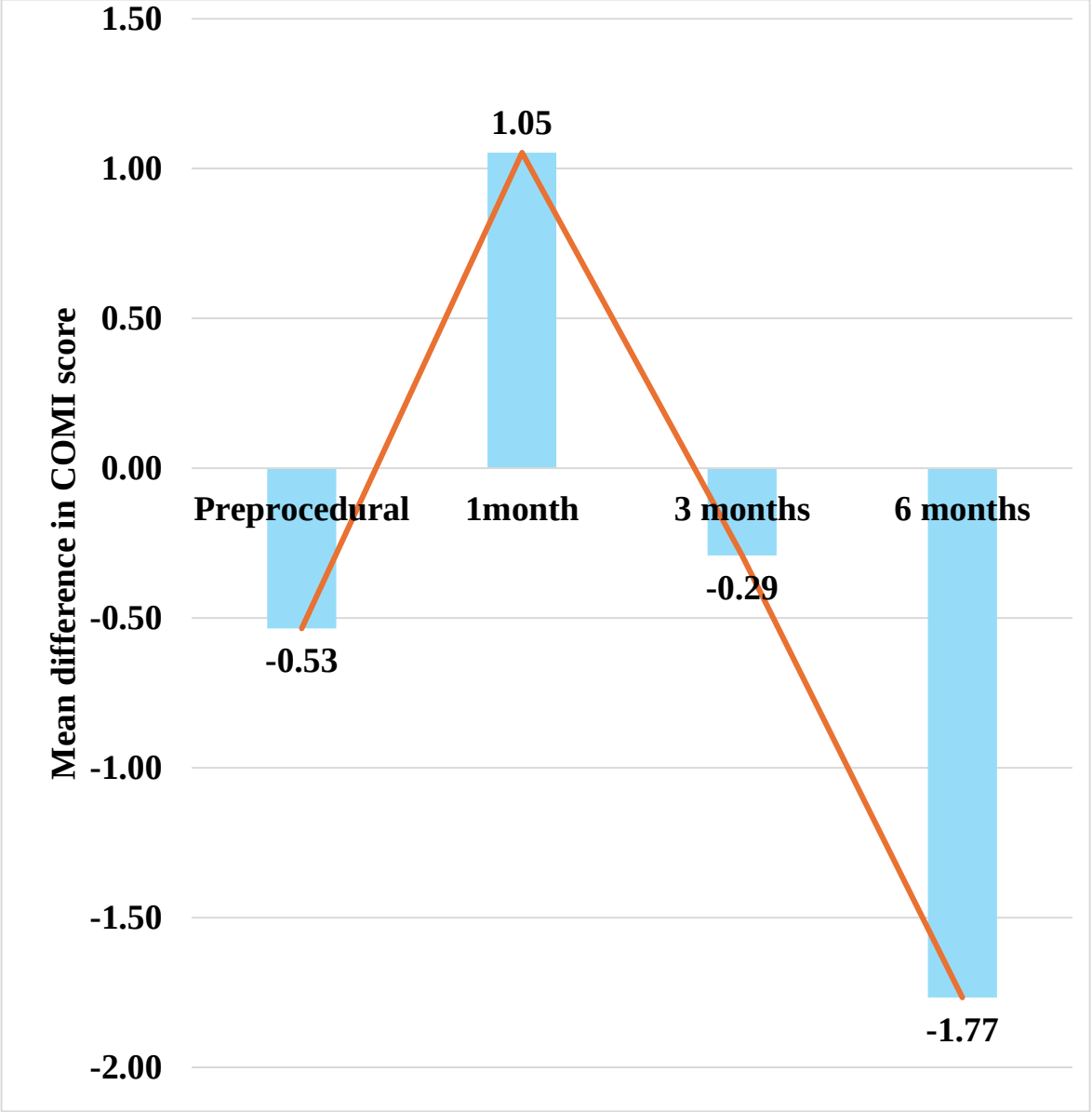

Figure 16: A combo diagram is presented to illustrate the differences in COMI score across the study groups prior to and following the procedure at 1 month, 3 months, and 6 months using the Independent T

Table 18: The MRM scores of the study groups were compared before and after the procedure at 1 month, 3 months, and 6 months using an Independent T test.

MRM score		Mean	Std. Dev	Mean diff.	P value
Preprocedural	PRP	19.477	3.8873	-4.9604	0.011
	Steroid	24.438	12.6528		
1 month	PRP	24.287	4.7725	-26.4854	0.0001
	Steroid	50.773	10.2374		
3 months	PRP	58.7521	3.63716	-2.63583	0.022
	Steroid	61.3879	6.97101		
6 months	PRP	86.313	2.2881	18.7896	0.0001
	Steroid	67.523	5.6114		

Prior to the injection, the mean pain-related disability score for the PRP group was 19.47, whereas the mean MRM score for the CS group was 24.43. This difference in MRM score before procedure was P = 0.011 (statistically significant) by Independent T test.

The mean MRM score in the PRP group was 24.28 one month following the injection, whereas the mean score in the steroid group was 50.77 one month following the injection. This difference in MRM score at 1 month after the injection between the two study groups was p = 0.0001 (statistically significant) by Independent T test.

The PRP group's mean pain-related disability score three months after the injection was 58.75, whereas the steroid group's mean MRM score was 61.38. This difference in pain related disability score at 3 months after the injection between the two study groups was P = 0.02 (statistically significant) by Independent T test.

After six months, the mean pain-related disability score for the PRP group was 86.31, whereas the mean score for the steroid group was 67.52 following injection. This difference in MRM score at 6 months after the injection between the two study groups was P = 0.0001 (statistically significant) by Independent T test.

Based on the above findings it was inferred that PRP was better than Steroid in reducing pain related disability (MRM) at long term (6 months), whereas steroid was better than PRP in reducing pain related disability at short term (1 and 3 months).

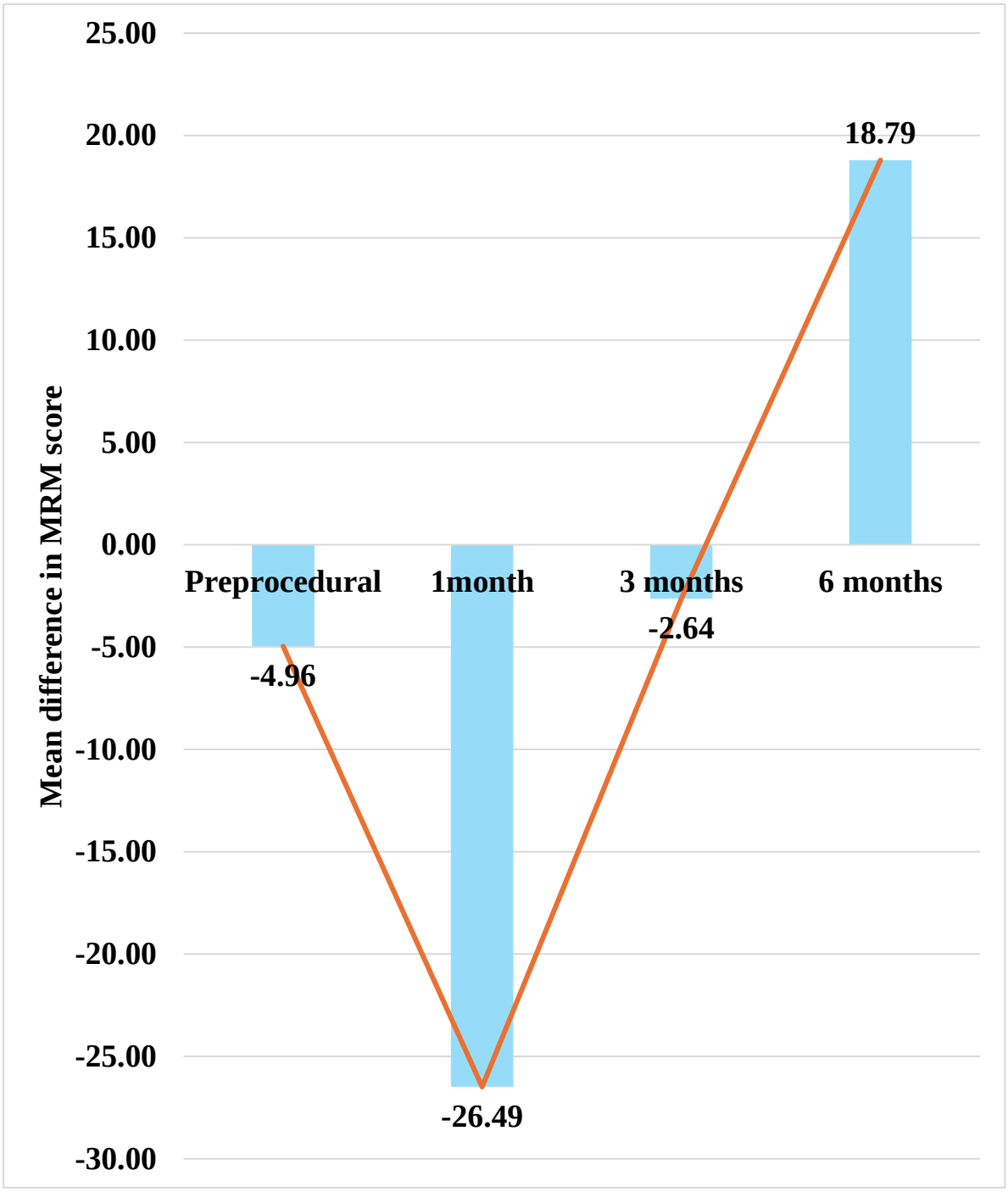

Figure 17: A combination diagram illustrating the variations in MRM score across the study groups prior to and following the procedure at 1 month, 3 months, and 6 months, using an Independent T test.

DISCUSSION

All patients diagnosed with lumbar disc herniation radiculopathy from September 2022 to December 2023 and admitted to the Orthopaedics department of RL Jalappa hospital in Kolar were taken up in the study. A patient has a comprehensive evaluation, which includes a medical history, physical examination, and imaging tests, once they have met all inclusion and exclusion criteria. Group A and Group B, both including 96 patients, were split evenly (48 patients in each group). Following the acquisition of permission and surgical fitness, patients were administered PRP to group A via transforaminal injection and corticosteroids to group B.

During the follow-up of 6 months, each patient was evaluated using the MODI, VAS, MRM, and COMI.

We compared the functional efficacy of PRP versus CS injection in lumbar disc herniation radiculopathy when these injections were administered via TFR under the guidance of fluoroscopy.

After the 6 months of follow up period 3 patients underwent surgery, of which 2 patients are from CS group and 1 patient is from PRP group.

Comparison of baseline characteristics of the study groups

For the LDHR patients in the PRP group in this study, the mean age was 40.75 ± 10.8 years, and for the LDHR patients in the Steroid group, it was 43.52 ± 8.9 years. About 54.2% of the LDHR patients were male in PRP group, and the remaining 45.2% were female. Similarly, 52.1% of the LDHR patients were male in steroid group, and the remaining 47.9% were female. After the follow up of 6 months 3 patients underwent surgery, of which 2 are from CS group and 1 is from PRP group.

Singh et al. conducted a RCT in India, comparing the mean age of LBP patients in the PRP group (46.71 ± 10.5 years) to the mean age of LBP patients in the steroid group (42.52 ± 11.38 years). In the PRP group, about 57.1% of the patients with LBP were male, while in the steroid group, approximately 66.7% of the patients were male. [66]

Demirci did a retrospective study on 62 patients. The PRP group's average age of LBP patients with LRP were 49.6 ± 13 years, whereas the Steroid group's average age of LBP patients with LRP was 46.8 ± 11.6 years. In the PRP group, about 25.8% of patients with radiculopathy were male, while in the steroid group, approximately 45.1% of patients were male. [67]

Gupta et al. conducted a study with a total of 30 patients, with 15 patients allocated to each group. The PRP group consisted of 8 females and 7 males,

while the CS group consisted of 7 females and 8 males. The average age of both groups was 48.87 years. [2]

Xu et al. conducted a prospective RCT in China, where the average age of the patients with LDHR was 56 years in both the PRP and steroid groups. In the PRP group, approximately 41.3% of LDHR patients were female, while in the steroid group, approximately 54.1% of patients were female. [11]

Comparative results in VAS score with similar studies (PRP injection group)

The VAS score was 6.65 prior to the PRP injection, but it decreased to 5.17 after one month. Subsequently, the pain score experienced an additional decline at three months (3.27), and a significant decline at six months (1.65), all of which occurred after the PRP injection. Following PRP injection, patients with LDHR consistently experienced a decrease in their pain score.

Table 19: Comparison of VAS score in PRP injection group with similar studies

Authors	Mean VAS score			
	Preprocedural	**1 month**	**3 months**	**6 months**
Present study	6.65	5.17	3.27	1.65
Wu et al[33]	7.05	4.89	2.63	-
Xu et al [11]	6	3	3	2
Singh et al[66]	6.91	4.52	2.43	1.43
Demirci [67]	8.88	4.24	-	3.94
Gupta et al[2]	7.67	2.27	6.27	6.73

Comparable findings were noted in study by Xu et al [11], Wu et al[33] and Singh et al[66]. Partially supportive results were observed in the study by Demirci [67]. In all these studies there is a consistent reduction in pain score after steroid injection. Contrast findings were observed in the study by Gupta et al in which pain score increased after a month and PRP had its effects for only one month. [2]

Comparative results in VAS score with similar studies (Steroid injection group)

The VAS score was 6.81 prior to the steroid injection, but it decreased to 3.85 after one month. Subsequently, the pain score experienced an additional decline at three months (2.75), and a significant decline at six months (2.31), all of which occurred after the steroid injection. Following steroid injection, the pain score for LDHR patients consistently decreased.

Table 20: Comparison of VAS score in Steroid injection group with similar studies

Authors	**Mean VAS score**			
	Preprocedural	**1 month**	**3 months**	**6 months**
Present study	6.81	3.85	2.75	2.31
Xu et al [11]	6	3	3	2
Singh et al[66]	7.38	3.57	5.14	5.43
Demirci [67]	8.2	3.2	-	3.7
Gupta et al[2]	7.13	0.67	1.13	1.33
McCormick et al [68]	6.2*	3.2*	4.1*	4.1*

* Numerical rating scale (NRS) used

Comparable findings were noted in study by Xu et al [11] and Gupta et al[2]. Partially supportive results were observed in the study by Singh et al[66], Demirci [67] and McCormick et al [68]. In all these studies there is a consistent reduction in pain score after steroid injection.

Based on the above findings it was inferred that PRP was better than Steroid in reducing perceived pain (VAS) at long term (6 months), whereas steroid was better than PRP in reducing perceived pain at short term (1 and 3 months). They may provide longer-lasting pain relief than steroids, which can only last a few weeks or months. PRP is also considered safer than steroids and can be used continuously.

Comparative results in MODI score with similar studies (PRP injection group)

The disability score (MODI) was 53.69 prior to the PRP injection, but it decreased to 42.67 after one month. Subsequently, the disability score experienced an additional decline at three months (19.75), and a significant decline at six months (11.35), all of which occurred after the PRP injection. After receiving PRP injections, LDHR patient's MODI disability scores consistently decreased.

Table 21: Comparison of MODI score in PRP injection group with similar studies

Authors	Mean MODI score			
	Preprocedural	**1 month**	**3 months**	**6 months**
Present study	53.69	42.67	19.75	11.35
Xu et al [11]	35	22	20	20
Demirci [67]	63.7*	33.9*	-	32.6*
Gupta et al[2]	55.73	10.27	44.93	51.97
Bise et al[45]	29.8*	23#	-	-

* MODI was used, # at 6 weeks

Contrast findings were noted in study by Gupta et al[2]. Partially supportive results were observed in the study by Xu et al [11], Demirci [67] and Bise et al[45]. Most of these studies shows consistent reduction in disability score after autologous PRP injection. However, study by Gupta et al[2] shows increase in disability score after 1 month and it was due to pain score increased after a month and PRP had it effects for only one month.

Comparative results in MODI score with similar studies (Steroid injection group)

The disability score (MODI) was 55.98 prior to the steroid injection, but it decreased to 35.13 after one month. Subsequently, the disability score experienced an additional decline at three months (25.25), and a significant decline at six months (18.04), all of which occurred after the steroid injection. Following steroid injection, the MODI disability score of LDHR patients consistently decreased. Comparable findings were noted in study by Gupta et al[2]. Partially supportive results were observed in the study by Xu et al [11], Demirci [67] and Bise et al[45]. In all these studies there is a consistent reduction in disability score after Steroid injection.

Table 22: Comparison of MODI score in Steroid injection group with similar studies

Authors	Mean MODI score			
	Preprocedural	**1 month**	**3 months**	**6 months**
Present study	55.98	35.13	25.25	18.04
Xu et al [11]	35	22	20	20
Demirci [67]	62.1*	30.2*	-	32.8*
Gupta et al[2]	54.53	14.67	12	12
Bise et al[45]	30*	20#	-	-

* MODI was used, # at 6 weeks

Based on the above findings it was inferred that PRP is better than Steroid in reducing disability (MODI) in the long term (3 and 6 months), whereas steroid was better than PRP in reducing disability at short term (1 month). The disability score corresponds to variation in VAS score. The study patients with LDHR show a significant increase in their functional abilities when their pain score drops.

Comparative results in MRM score with similar studies (PRP injection group)

The pain related disability score (MRM) was 19.47 prior to the PRP injection, but it increased to 24.28 after one month. Subsequently, the pain related disability score experienced an additional increase at three months (58.75), and a significant incline at six months (86.31), all of which occurred after the PRP injection. In the treatment of LDHR patients, there was a consistent increase in MRM pain related disability score after PRP injection.

Comparable findings were noted in study by Akeda et al. [70] Partially supportive results were observed in the study by Kotb et al[69] and Wu et al[71]. In all these studies there is a consistent reduction in pain related disability score after autologous PRP injection. In the present study scores were converted into percentage but not in other studies.

Table 23: Comparison of MRM score in PRP injection group with similar studies

Authors	Mean MRM score			
	Preprocedural	1 month	3 months	6 months
Present study	19.47	24.28	58.75	86.31
Kotb et al[69]	19.33	-	14.27	-
Akeda et al[70]	12.6	5.1	-	3.6
Wu et al[71]	17.2	-	-	8.2

Comparative results in MRM score with similar studies (Steroid injection group)

The pain related disability score (MRM) was 24.43 prior to the steroid injection, but it increased to 50.77 after one month. Subsequently, the pain related disability score experienced an additional increase at three months (61.38), and a significant incline at six months (67.52), all of which occurred after the steroid injection. In the treatment of LDHR patients, following steroid injection, the MRM pain-related disability score showed a continuous improvement.

Partially supportive results were observed in the study by Kotb et al[69] and Wu et al[71]. In all these studies there is a consistent reduction in pain related disability score after steroid injection. In the present study scores were converted into percentage but not in other studies.

Table 24: Comparison of MRM score in Steroid injection group with similar studies

Authors	**Mean MRM score**			
	Preprocedural	**1 month**	**3 months**	**6 months**
Present study	24.43	50.77	61.38	67.52
Kotb et al[69]	19.13	-	15.20	-
Wu et al[71]	17.3	-	-	13.6

There is a significant decrease in self-rated physical disability in both the groups. Based on the above findings it was inferred that PRP was better than Steroid in reducing pain related disability (MRM) at long term (6 months), whereas steroid was better than PRP in reducing pain related disability at short term (1 and 3 months). The pain-related disability score is directly proportional to the variance in the VAS score, and there was no difference been observed between the study groups. There is a notable enhancement in the functional

capacity of the individuals participating in the LDHR research as their pain score falls.

In 2023, Singh et al. conducted a study in India to assess 60 patients with back pain. Injectable autologous PRP has been identified as the most effective new injectable treatment for LFJS when administered via intra-articular injection. After a 6-month period of monitoring, it was determined that both steroid injections and PRP injections were both safe and effective in treating LFJS. However, autologous PRP has the potential to be more efficacious over an extended duration. [72]

Xu et al. conducted a RCT in China in 2021 to assess the safety and efficacy of steroid injections compared to ultrasound-guided EPRPI for the treatment of LDHR.[11] A study revealed that lumbar disc herniation patients who underwent transforaminal injections of PRP achieved comparable outcomes to those who got steroid injections. This indicates that PRP injections have the potential to be a safer option.

A non-randomized comparison study was carried out by Bise in France by the year 2021 with the purpose of comparing the effectiveness of interlaminar CT-guided EPRPI and ESI in the treatment of persistent LRP that had been present for more than six weeks. [45] When it comes to the treatment of chronic LRP, CT-guided interlaminar EPRPI has results that are comparable to those of ESI and may turn out to be a more secure alternative.

The data indicated that steroid injections could alleviate pressure on inflamed nerves and reduce swelling, thereby reducing discomfort. Nevertheless, these treatments have a tendency to cause enduring damage to muscles or joints, despite the fact that they may provide temporary relief. CS have been shown to reduce inflammation by preventing the production or release of numerous pro-inflammatory substances and by eliciting a transient numbing effect in the affected area.

PRP injections have the capacity to expedite the healing process and restore damaged tissue. They may provide a more long-lasting form of pain relief compared to steroids, which have a limited effectiveness for a few weeks or months. PRP is considered a safer substitute for steroids and can be regularly injected. PRP is a biological product that can be applied externally to various tissues. By inducing the production of increased platelet-derived growth factors, this treatment enhances the body's natural healing process. Moreover, PRP possesses antibacterial characteristics that could assist in the prevention of infections. The use of a novel technique, local injection of PRP, has proven to be highly effective in treating a range of painful disorders. PRP has demonstrated promise in the treatment of tendinopathy, osteoarthritis in the knee, muscle strain injuries, and ligament injuries. It has been associated with significant pain reduction, decreased disability, and improved functional ability.

Additionally, PRP has been found to enhance structural integrity and biomechanical strength. [49]

Studies on platelet-rich plasma (PRP) therapy have demonstrated substantial decreases in pain intensity, as assessed by many pain assessment scales. Patients have been able to resume their regular physical activity because of the therapeutic benefits. Variations were shown in the number of injections (one, two, or at different levels), the volume of PRP administered (1 to 5 mL), the starting volume of whole blood (9 to 20 mL), and the duration of the follow-up periods (8 weeks to 18 months). [46]

Current developments in PRP therapy involve the implementation of further randomized, controlled, and impartial clinical trials to produce a greater amount of top-notch evidence. Moreover, it is imperative to examine the long-term consequences of PRP injections, including any potential adverse effects, over extended periods of observation. One such clinical approach is to conduct research that compares the effectiveness of single injection regimens vs multiple injection regimens. Further investigation can be conducted on the method used to prepare PRP, including the initial volume of whole blood, platelet concentration, composition of PRP, and the amount of PRP injected. Additional study on the listed areas will offer clinicians more specific guidance and indications for developing individualized treatment programs, leading to enhanced clinical outcomes.

CONCLUSION

According to the study findings, PRP and steroids both worked well to decrease pain and functional impairment in LDHR patients. However, in comparison to the steroid group, the PRP group showed a more pronounced and long-lasting decrease in pain as well as an improved functional impairment over the long-term follow-up. Steroids administered to patients demonstrated substantial improvement in the immediate aftermath; however, their efficacy diminished over time. Patients have been able to resume their regular physical activity because of the clinically beneficial effects.

The VAS, MODI, and MRM questionnaires were employed to evaluate the significant decrease in pain and impairment observed in both groups. The outcome of LDHR patients was significantly improved in both categories, as determined by COMI. However, because of its prolonged potency, autologous PRP might be a better therapeutic choice.

To further support the validity of these findings, future studies should consider carrying out a placebo-controlled trial with a bigger sample size and better patient selection criteria.

LIMITATION

- This trial was administered without a placebo-controlled group to facilitate comparison with the PRP plus steroid group.
- It is conceivable that the results may not be pertinent to the entire community, given the restricted research site and the limited number of participants.
- The potential complications of TFR injection - epidural puncture, and the potential concerns regarding the administration of PRP and steroids were not considered.
- To determine patient eligibility, we did not conduct a preliminary diagnostic block. Therefore, our diagnosis confirmation and patient selection were entirely contingent upon a comprehensive clinical examination.
- We evaluated clinical parameters using the VAS, MODI, and MRM scoring. The impact of procedure was not assessed through the use of radiological/laboratory parameters.

SUMMARY

Surgeons frequently encounter a substantial number of patients who exhibit symptoms indicative of lumbar disc herniation radiculopathy. Several clinical trials have demonstrated the effectiveness of PRP injections, which possess anti-inflammatory and healing qualities, as a treatment for this problem. The transforaminal approach was more effective than intramuscular, and caudal injections because it could reduce inflammation caused by compression at specific locations of spine.

The objective of this observational study was to compare the functional efficacy of PRP versus CS injection in lumbar disc herniation radiculopathy when these injections were administered via TFR under the guidance of fluoroscopy.

All patients diagnosed with lumbar disc herniation radiculopathy from September 2022 to December 2023 and admitted to the Orthopaedics department of RL Jalappa hospital in Kolar were taken up in the study. A patient underwent a comprehensive evaluation that included a medical history, physical examination, and imaging tests after they met all inclusion and exclusion criteria. The 96 patients were divided into two groups, Group A and Group B, each including 48 patients. Following the acquisition of permission and surgical fitness, patients were administered PRP to group A via

transforaminal injection and corticosteroids to group B. During the follow-up of 6 months, each patient was evaluated using the MODI, VAS, MRM, and COMI.

In the PRP group, the average age of the LDHR patients was 40.75 ± 10.8 years, while in the Steroid group, it was 43.52 ± 8.9 years. About 54.2% of the LDHR patients were male in PRP group, and the remaining 45.2% were female. Similarly, 52.1% of the LDHR patients were male in steroid group, and the remaining 47.9% were female.

In PRP group, bilateral radiculopathy was observed in 45.8% of the patients, right side radiculopathy was observed in 35.4% of the patients, while left side radiculopathy was observed in only 18.8% of the LDHR patients. In the steroid group, bilateral radiculopathy was observed in only 22.9% of the LDHR patients, right side radiculopathy was observed in 39.6% of the LDHR patients while left side radiculopathy was observed in 37.5% of the LDHR patients.

In the treatment of LDHR patients, there was a consistent reduction in VAS score after PRP and Steroid injection. Based on the findings it was inferred that PRP was better than Steroid in reducing VAS at long term (6 months), whereas steroid was better than PRP in reducing perceived pain at short term (1 and 3 months).

In the treatment of LDHR patients, there was a consistent reduction in MODI disability score after PRP and steroid injection. Based on the findings it was inferred that PRP was better than Steroid in reducing disability (MODI) in the

long term (3 and 6 months), whereas steroid was better than PRP in reducing disability at short term (1 month).

In the treatment of LDHR patients, there was a consistent reduction in COMI outcome score after PRP and steroid injection. Based on the findings it was inferred that PRP was better than Steroid in improving outcome (COMI) at long term (6 months), whereas steroid was better than PRP in improving outcome at short term (1 and 3 months). But it was not statistically significant. Hence there was no difference in COMI score between the PRP and Steroid groups after the injection.

In the treatment of LDHR patients, there was a consistent increase in MRM pain related disability score after PRP and steroid injection. Based on the findings it was inferred that PRP was better than Steroid in reducing pain related disability (MRM) at long term (6 months), whereas steroid was better than PRP in reducing pain related disability at short term (1 and 3 months).

The results of the research study showed that PRP and steroids were equally effective in reducing pain and functional impairment in patients with LDHR. However, the PRP group had a more pronounced and enduring decrease in pain intensity and enhancement in functional impairment compared to the steroid group in long term follow up. The patients who were administered steroids had a significant improvement in the short term, but their effectiveness declined later.

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ANNEXURE

ANNEXURE 1

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR - 563101.

PATIENT INFORMATION SHEET

STUDY TITLE: "COMPARATIVE STUDY OF FLUOROSCOPY GUIDED TRANSFORAMINAL PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR LUMBAR DISC HERNIATION RADICULOPATHY"

Study location: R L Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar.

Details- Patients presenting with lumbar radicular pain in the Emergency department or OPD of R.L.J. HOSPITAL AND RESEARCH CENTRE, attached to SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR

Patients in this study will have to undergo routine blood investigations (CBC, RFT, HIV& HBsAG), MRI lumbosacaral spine and x-ray of lumbosacaral spine –AP and LAT view

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in the study, we will collect information (as per proforma) from you or a person responsible for you or both. Relevant history will be taken. This information collected will be used only for dissertation and publication.

All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care you will get will not change if you don't wish to participate. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

CONFIDENTIALITY

Your medical information will be kept confidential by the study doctor and staff and will not be made publicly available. Your original records may be reviewed by your doctor or ethics review board. For further information/ clarification please contact

DR ROHITH C SUNIL,
Department of ORTHOPAEDICS,
SDUMC, Kolar
CONTACT NO: 9400018377

ANNEXURE 2

Date:

INFORMED CONSENT FORM

I Mr./Mrs. _____ have been explained in my own understandable language, that I will be included in a study which is**"COMPARATIVE STUDY OF FLUOROSCOPY GUIDED TRANSFORAMINAL PLATELET RICH PLASMA VERSUS CORTICOSTEROID INJECTION FOR LUMBAR DISC HERNIATION RADICULOPATHY"**

I have been explained that my clinical findings, investigations, postoperative findings will be assessed and documented for study purpose.

I have been explained my participation in this study is entirely voluntary, and I can withdraw from the study any time and this will not affect my relation with my doctor or the treatment for my ailment.

I have been explained about the interventions needed possible benefits and adversities due to interventions, in my own understandable language.

I have understood that all my details found during the study are kept confidential and while publishing or sharing of the findings, my details will be masked.

I have principal investigator mobile number for enquiries.

I in my sound mind give full consent to be added in the part of this study.

Signature of the patient:

Name:

Signature of the witness:

Name:

Relation to patient:

Place:

ANNEXURE 3

ಮಾಹಿತಿ ಒಪ್ಪಿಗೆ ನಮೂನೆ

ನಾನು ಶ್ರೀ/ಶ್ರೀಮತಿ. _____ ಅನ್ನು ನನ್ನ ಸ್ವಂತ ಆರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ, "ಫ್ಲೋರೋಸ್ಕೋಪಿ ಗೈಡೆಡ್ ಟ್ರಾನ್ಸ್ ಫಾರಮಿನಲ್ ಪ್ಲೇಟ್‌ಲೆಟ್ ರಿಚ್ ಪ್ಲಾಸ್ಮಾ ವರ್ಸಸ್ ಕಾರ್ಟಿಕೋಸ್ಟೆರಾಯ್ಡ್ ಇಂಜೆಕ್ಷನ್ ಫಾರ್ ಲುಂಬಾರ್ ಡಿಸ್ಕ್ ಹರ್ನಿಯೇಷನ್ ರೇಡಿಕ್ಯುಲೋಪತಿ"ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ

ನನ್ನ ಕ್ಲಿನಿಕಲ್ ಸಂಶೋಧನೆಗಳು, ತನಿಖೆಗಳು, ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ನಂತರದ ಸಂಶೋಧನೆಗಳನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುತ್ತದೆ ಮತ್ತು ಅಧ್ಯಯನ ಉದ್ದೇಶಕ್ಕಾಗಿ ದಾಖಲಿಸಲಾಗುತ್ತದೆ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಭಾಗವಹಿಸುವಿಕೆಯು ಸಂಪೂರ್ಣವಾಗಿ ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ ಮತ್ತು ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನದಿಂದ ಹಿಂದೆ ಸರಿಯಬಹುದು ಮತ್ತು ಇದು ನನ್ನ ವೈದ್ಯರೊಂದಿಗಿನ ನನ್ನ ಸಂಬಂಧ ಅಥವಾ ನನ್ನ ಕಾಯಿಲೆಯ ಚಿಕಿತ್ಸೆಯ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುವುದಿಲ್ಲ ಮತ್ತು ಅಧ್ಯಯನದ ಎಲ್ಲಾ ವೆಚ್ಚವನ್ನು ನೋಡಿಕೊಳ್ಳುತ್ತದೆ. ತನಿಖಾಧಿಕಾರಿ

ನನ್ನ ಸ್ವಂತ ಆರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ಮಧ್ಯಸ್ಥಿಕೆಗಳಿಂದಾಗುವ ಸಂಭವನೀಯ ಪ್ರಯೋಜನಗಳು ಮತ್ತು ಪ್ರತಿಕೂಲತೆಗಳ ಆಗತ್ಯವಿರುವ ಮಧ್ಯಸ್ಥಿಕೆಗಳ ಬಗ್ಗೆ ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಪತ್ತೆಯಾದ ನನ್ನ ಎಲ್ಲಾ ವಿವರಗಳನ್ನು ಗೌಪ್ಯವಾಗಿ ಇರಿಸಲಾಗಿದೆ ಮತ್ತು ಸಂಶೋಧನೆಗಳನ್ನು ಪ್ರಕಟಿಸುವಾಗ ಅಥವಾ ಹಂಚಿಕೊಳ್ಳುವಾಗ, ನನ್ನ ವಿವರಗಳನ್ನು ಮರೆಮಾಚಲಾಗುತ್ತದೆ ಎಂದು ನಾನು ಆರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ

ವಿಚಾರಣೆಗಾಗಿ ನಾನು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಮೊಬೈಲ್ ಸಂಖ್ಯೆಯನ್ನು ಹೊಂದಿದ್ದೇನೆ.

ಈ ಅಧ್ಯಯನದ ಭಾಗದಲ್ಲಿ ಸೇರಿಸಲು ನನ್ನ ಉತ್ತಮ ಮನಸ್ಸಿನಲ್ಲಿ ನಾನು ಸಂಪೂರ್ಣ ಒಪ್ಪಿಗೆಯನ್ನು ನೀಡುತ್ತೇನೆ.

ರೋಗಿಯ ಸಹಿ:

ಹೆಸರು:

ಸಾಕ್ಷಿ ಸಹಿ:

ಹೆಸರು:

ರೋಗಿಗೆ ಸಂಬಂಧ:

ಸ್ಥಳ:

ANNEXURE 4

PROFORMA

CASE No.:

UHID No.:

1. BASIC DATA,
   - Name:
   - Age/Sex:
   - Address:
   - Occupation:
   - Mobile No.:
   - Date of Admission:
   - Date of Procedure:
   - Date of Discharge:
   - History:
   - General physical examination:

Vitals: Temp- Pulse-

BP- RR-

- Systemic examination:

CVS- CNS-

PA- RS-

- Pre-existing systemic illness: Diabetes/ Hypertension/ Thyroid disorder/ TB/ Anaemia/ Epilepsy/others.
- Local examination of L-S spine:

Spinal tenderness :

	RIGHT	LEFT
SLRT	:	
Patrick test	:	
Power - L2(Hip flexors)	:	
L3(Knee extensors)	:	
L4(Ankle dorsi flexion)	:	
L5(Toe extension)	:	
S1(Ankle plantar flexion)	:	

Sensation: Intact / Impaired.

Distal pulsation: Palpable / Absent.

- Radiological Investigations:

X-Ray: LS SPINE,

- Antero-posterior view:
- Lateral – Flexion/ Extension view:

MRI- LS Spine:

2. DIAGNOSIS:

3. BLOOD INVESTIGATIONS:

- CBC: HB- , WBC- , PLT-
- BT:
- CT:
- RBS:
- HIV, HCV &HBsAg Status

4. TREATMENT:

- Procedure:

- Type of anaesthesia:

5. POST PROCEDURE

- Post-Op drugs:

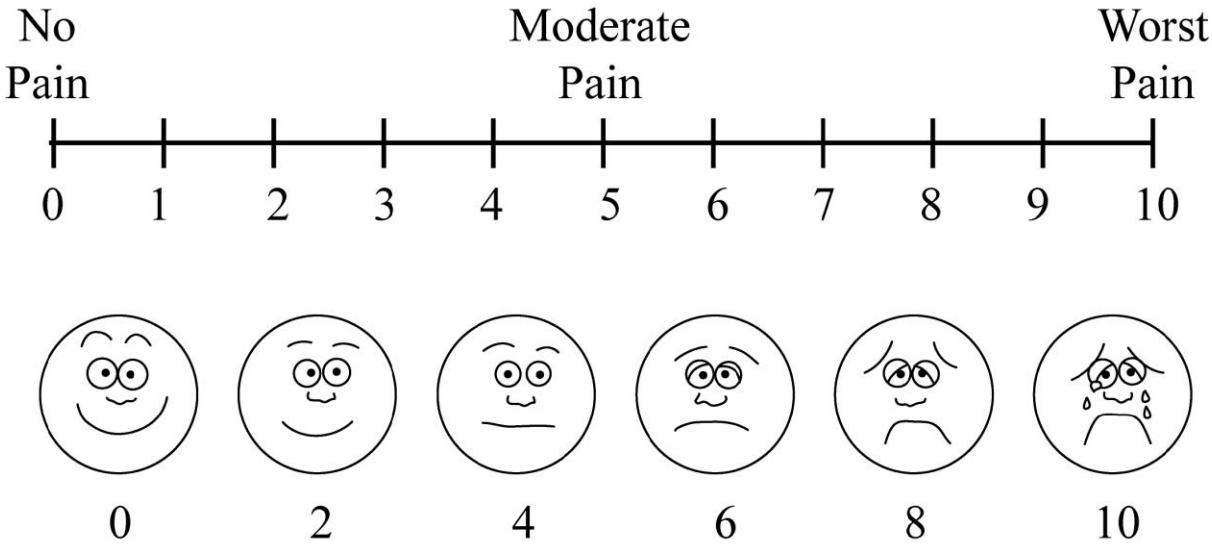
- Complications:

6. TIME OF DISCHARGE:

Overall functional assessment according to VAS, MRM, COMI, and ODI score done just before the procedure, post-procedure day 0, post-procedure 1 month, 3 months and 6 months.

	BASELINE	1 MONTH	3 MONTHS`	6 MONTHS
VAS				
MODI				
COMI				
MRM				

VAS



Modified Roland (Sciatica) Questionnaire

Patient Name:_____ **Date:**_____

Please read carefully:
When your leg hurts, you may find it difficult to do some of the things you normally do. This list contains some sentences people have used to describe themselves when they have sciatica. When you read them, you may find that some stand out because they describe you today. When you read a sentence that describes you today, put a check in the **YES** column. If the sentence does not describe you, check the **NO** column.

Yes	No	
□	□	1. I stay home most of the time because of my leg pain (sciatica).
□	□	2. I change position frequently to try and get my leg comfortable.
□	□	3. I walk more slowly than usual because of my leg pain (sciatica).
□	□	4. Because of my leg problem, I am not doing any of the jobs that I usually do around the house.
□	□	5. Because of my leg problem, I use a handrail to get upstairs.
□	□	6. Because of my leg problem, I have to hold onto something to get out of an easy chair.
□	□	7. I get dressed more slowly than usual because of my leg pain (sciatica).
□	□	8. I only stand for short periods of time because of my leg pain (sciatica).
□	□	9. Because of my leg problem, I try not to bend or kneel down.
□	□	10. I find it difficult to get out of a chair because of my leg pain (sciatica).
□	□	11. My leg is painful almost all the time.
□	□	12. I find it difficult to turn over in bed because of my leg pain (sciatica).
□	□	13. I have trouble putting on my socks (or stockings) because of my leg pain (sciatica).
□	□	14. I only walk short distances because of my leg pain (sciatica).
□	□	15. I sleep less well because of my leg problem.
□	□	16. I avoid heavy jobs around the house because of my leg problem.
□	□	17. Because of my leg problem, I am more irritable and bad tempered with people than usual.
□	□	18. Because of my leg problem, I go upstairs more slowly than usual.
□	□	19. I stay in bed most of the time because of my leg pain (sciatica).
□	□	20. Because of my leg problem, my sexual activity is decreased.
□	□	21. I keep rubbing or holding areas of my body that hurt or are uncomfortable.
□	□	22. Because of my leg problem, I am doing less of the daily work around the house than I would usually do.
□	□	23. I often express concern to other people over what might be happening to my health.

Examiner

Modified Oswestry Low Back Pain Disability Questionnaire

Pain Intensity

- I can tolerate the pain I have without having to use pain medication.
- The pain is bad, but I can manage without having to take pain medication.
- Pain medication provides me with complete relief from pain.
- Pain medication provides me with moderate relief from pain.
- Pain medication provides me with little relief from pain.
- Pain medication has no effect on my pain.

Personal Care (e.g., Washing, Dressing)

- I can take care of myself normally without causing increased pain.
- I can take care of myself normally, but it increases my pain.
- It is painful to take care of myself, and I am slow and careful.
- I need help, but I am able to manage most of my personal care.
- I need help every day in most aspects of my care.
- I do not get dressed, I wash with difficulty, and I stay in bed.

Lifting

- I can lift heavy weights without increased pain.
- I can lift heavy weights, but it causes increased pain.
- Pain prevents me from lifting heavy weights off the floor, but I can manage if the weights are conveniently positioned (e.g., on a table).
- Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- I can lift only very light weights.
- I cannot lift or carry anything at all.

Walking

- Pain does not prevent me from walking any distance.
- Pain prevents me from walking more than 1 mile. (1 mile = 1.6 km).
- Pain prevents me from walking more than 1/2 mile.
- Pain prevents me from walking more than 1/4 mile.
- I can walk only with crutches or a cane.
- I am in bed most of the time and have to crawl to the toilet.

Sitting

- I can sit in any chair as long as I like.
- I can only sit in my favorite chair as long as I like.
- Pain prevents me from sitting for more than 1 hour.
- Pain prevents me from sitting for more than 1/2 hour.
- Pain prevents me from sitting for more than 10 minutes.
- Pain prevents me from sitting at all.

Standing

- I can stand as long as I want without increased pain.
- I can stand as long as I want, but it increases my pain.
- Pain prevents me from standing for more than 1 hour.
- Pain prevents me from standing for more than 1/2 hour.
- Pain prevents me from standing for more than 10 minutes.
- Pain prevents me from standing at all.

Sleeping

- Pain does not prevent me from sleeping well.
- I can sleep well only by using pain medication.
- Even when I take medication, I sleep less than 6 hours.
- Even when I take medication, I sleep less than 4 hours.
- Even when I take medication, I sleep less than 2 hours.
- Pain prevents me from sleeping at all.

Social Life

- My social life is normal and does not increase my pain.
- My social life is normal, but it increases my level of pain.
- Pain prevents me from participating in more energetic activities (e.g., sports, dancing).
- Pain prevents me from going out very often.
- Pain has restricted my social life to my home.
- I have hardly any social life because of my pain.

Traveling

- I can travel anywhere without increased pain.
- I can travel anywhere, but it increases my pain.
- My pain restricts my travel over 2 hours.
- My pain restricts my travel over 1 hour.
- My pain restricts my travel to short necessary journeys under 1/2 hour.
- My pain prevents all travel except for visits to the physician / therapist or hospital.

Employment / Homemaking

- My normal homemaking / job activities do not cause pain.
- My normal homemaking / job activities increase my pain, but I can still perform all that is required of me.
- I can perform most of my homemaking / job duties, but pain prevents me from performing more physically stressful activities (e.g., lifting, vacuuming).
- Pain prevents me from doing anything but light duties.
- Pain prevents me from doing even light duties.
- Pain prevents me from performing any job or homemaking chores.

.

Core Outcome Measures Index (COMI)

Back problems can lead to back pain and/or pain in the legs/buttocks, as well as to sensory disturbances such as tingling, 'pins and needles', or numbness in any of these regions.

For the following 2 questions (1a and 1b) we would like you to indicate the severity of your pain, by marking a cross on the line from 0 to 10 (where "0"= **no** pain, "10"=the **worst** pain you can imagine).
There are separate questions for **back pain** and for **leg pain (sciatica)/buttock pain**

1a. How severe was your **back pain** in the last week?

no pain — **worst** pain that I can imagine

0 1 2 3 4 5 6 7 8 9 10

1b. How severe was your **leg pain (sciatica)/buttock pain** in the last week?

no pain — **worst** pain that I can imagine

0 1 2 3 4 5 6 7 8 9 10

2. During the **past week,** how much did your **back problem interfere with your normal work** (including both work outside the home and housework)?
   - 0 not at all
   - 2.5 a little bit
   - 5.0 moderately
   - 7.5 quite a bit
   - 10 extremely

3. If you had to spend **the rest of your life with the symptoms you have right now**, how would you feel about it?

   0 very satisfied
   2.5 somewhat satisfied
   5.0 neither satisfied nor dissatisfied
   7.5 somewhat dissatisfied
   10 very dissatisfied

4. Please reflect **on the last week**. How would you rate your quality of life?

   0 very good
   2.5 good
   5.0 moderate
   7.5 bad
   10 very bad

5. **<u>During the past 4 weeks,</u>** how many days did you **cut down** on the things you usually do (work, housework, school, recreational activities) because of your back problem?

   0 none
   2.5 between 1 and 7 days
   5.0 between 8 and 14 days
   7.5 between 15 and 21 days
   10 more than 21 days

6. **<u>During the past 4 weeks,</u>** how many days did your back problem **keep you from going to work** (job, school, housework)?

   0 none
   2.5 between 1 and 7 days
   5.0 between 8 and 14 days
   7.5 between 15 and 21 days
   10 more than 21 days

ANNEXURE 5

Figure 18: Centrifugation machine

Figure 19: Patient positioned in prone position over OT table

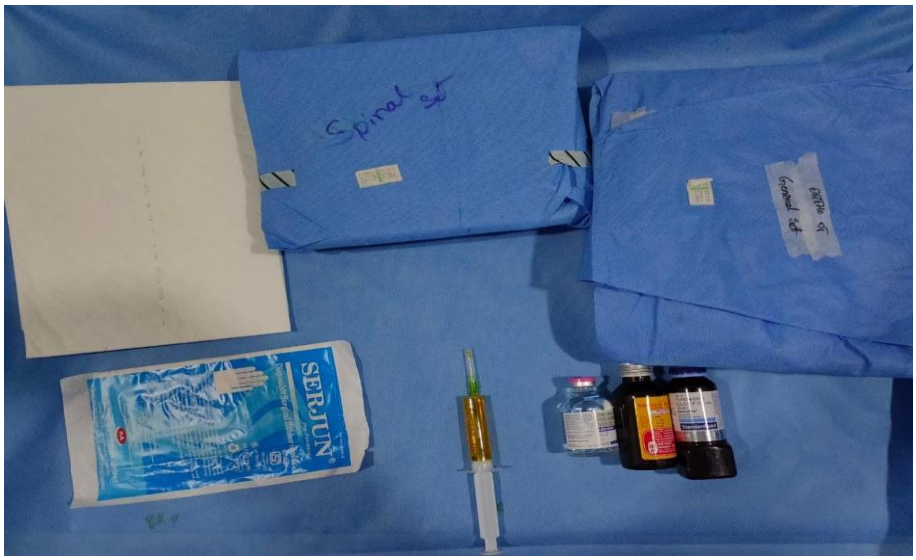
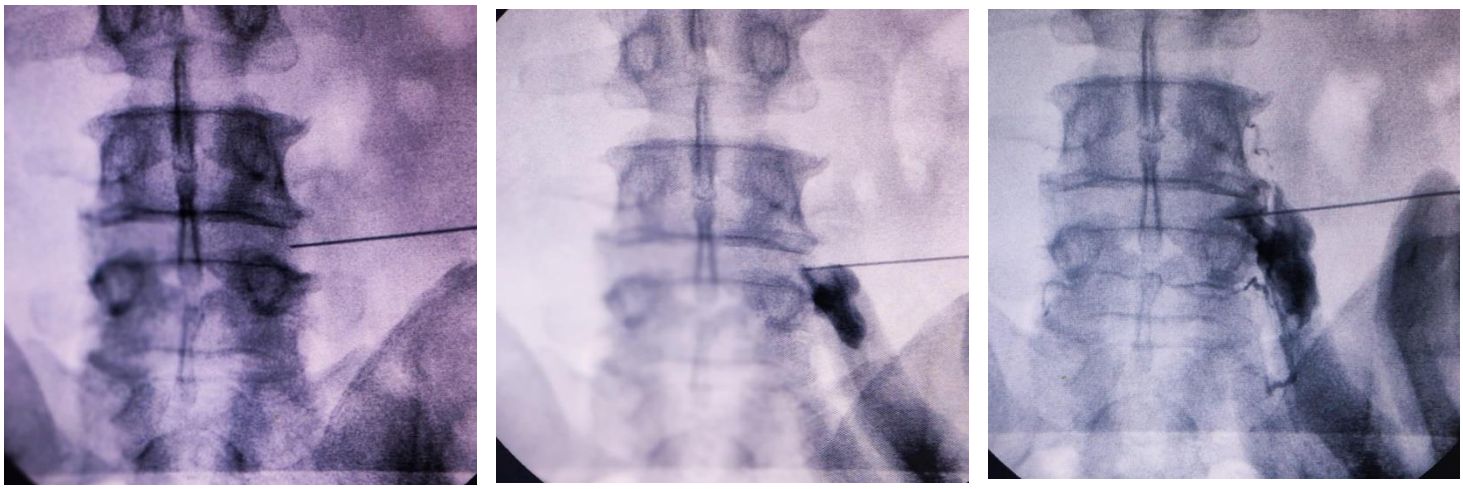


Figure 20: Sterile kit for Transforaminal PRP injection



(a) **(b)** **(c)**

Figure 21: Fluoroscopy image of a) positioning of needle at L4-L5 b) injection of contrast c) dispersion of contrast after injection of PRP

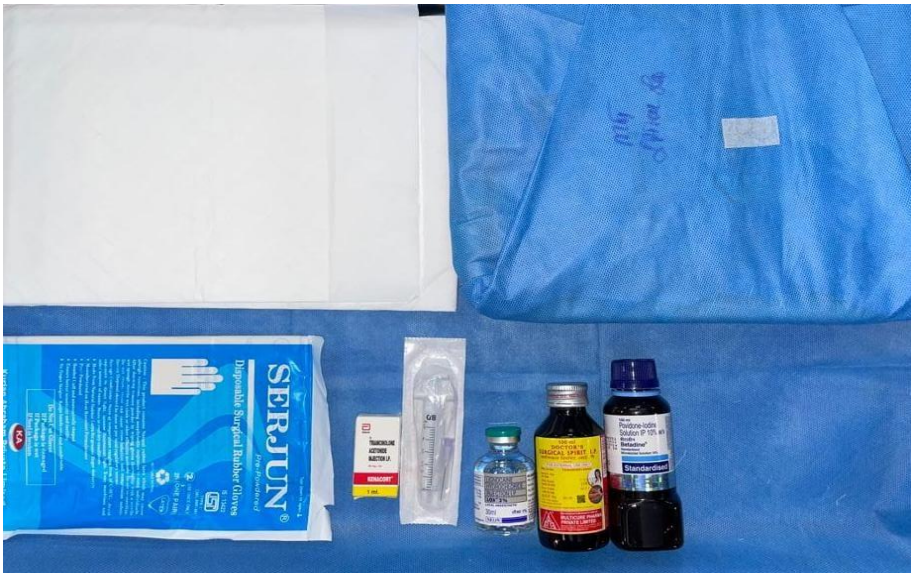
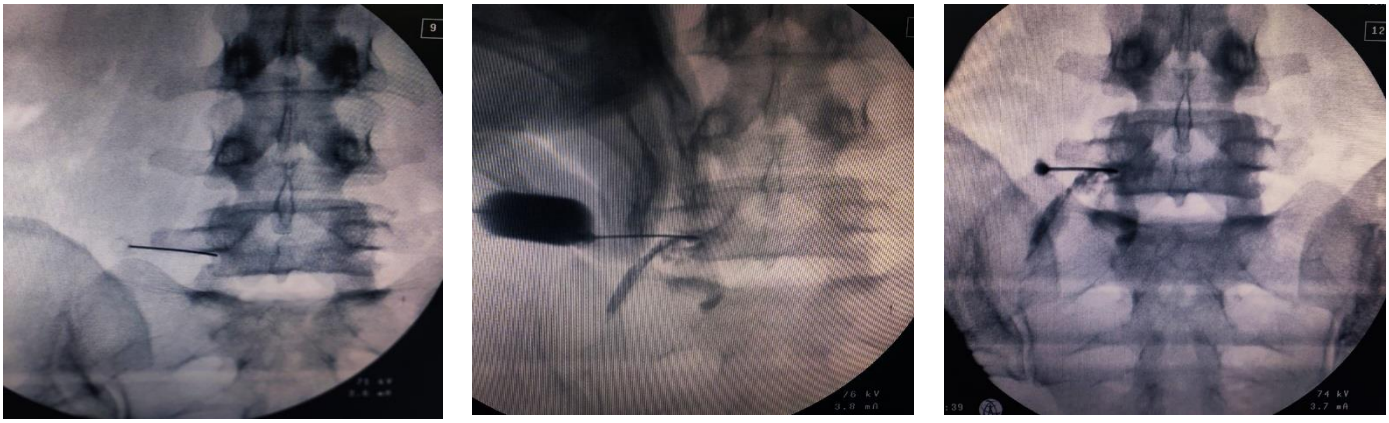


Figure 22: Sterile kit for Transforaminal Corticosteroid injection



(a) (b) (c)

Figure 23: Fluoroscopy image of a) positioning of needle at L5-S1 b) injection of contrast c) dispersion of contrast after injection of PRP

ANNEXURE 6

MASTER CHART

Key to master chart

Rad	Radiculopathy
M	Male
F	Female
L	Left
R	Right
B/L	Bilateral
Mt	Month/months
Bs	Baseline

PRP GROUP

				VAS				MODI (%)				COMI				MRM			
SL No	AGE	SEX	Rad	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt
1	40Y	F	R	5	4	3	1	58	44	18	11	5	4	3	1	14	14.3	57.1	85.7
2	39Y	F	R	6	4	3	1	59	43	28	14	7.2	5.8	3.6	1	25	25	60	88
3	40Y	F	L	6	4	3	1	59	46	23	12	6	4.8	3.3	1	20	20.1	58	86.3
4	48Y	F	L	7	5	4	1	40	30	16	10	5.9	4.5	2.3	1	14	14.3	56.8	85.3
5	39Y	F	B/L	7	5	3	1	50	43	18	14	7.2	4	3.6	1	15	20.1	57.1	88
6	59Y	F	L	7	6	4	1	59	44	16	10	6	4.5	2.3	1	14	20.1	58	85.3
7	34Y	F	R	7	5	3	1	58	46	28	12	6	5.8	3.3	1	20	25	60	86.3
8	36Y	F	B/L	7	6	3	1	58	46	18	12	5	4.8	3	1	14	20.1	58	85.7
9	42Y	M	B/L	6	5	3	2	59	43	23	14	6	5.8	3.3	1	20	25	58	88
10	58Y	M	L	7	6	3	1	50	46	20	10	8	7.2	4.8	1	25	30	60	88
11	30Y	F	R	6	5	3	1	50	44	23	11	8	6	3.6	1	26	32	56	84
12	27Y	M	B/L	6	5	3	2	59	46	18	11	7.2	6	3	1	20	22	60	89
13	48Y	M	B/L	6	4	3	1	59	44	20	11	8	6	4.8	1	25	33	60	88
14	33y	M	l	7	5	3	1	59	39	20	9	5	3.8	2.3	1	19	26	59	87.3
15	26Y	M	R	7	6	5	2	58	33	18	14	5	4.8	3	1	14	20	58	87
16	42y	M	R	7	5	3	1	57	44	17	11	8	5.8	3.4	1	25	34	60	89
17	39Y	F	R	7	6	5	2	50	46	20	11	8	6	4.8	1	25	36	57	85
18	37Y	F	B/L	7	5	3	2	58	46	18	11	5	3.8	2.2	1	14	21	56.8	89.1
19	41Y	F	B/L	7	6	3	1	52	39	21	11	6.3	5.8	2.6	1	20	15	55.6	84.3
20	59Y	F	B/L	7	5	3	1	53	37	16	10	5.2	4.3	2.6	1	24	30.3	64	89.1
21	52Y	M	R	7	5	3	2	62	51	19	11	8	7	3.8	1	16	21.2	68	83
22	40Y	F	B/L	7	5	3	2	58	43	18	14	7.2	4	3.6	1	15	20.2	57.2	88
23	47Y	F	L	7	6	4	2	49	44	16	10	6	4.5	2.3	1	14	20.1	55	85.3

				VAS				MODI (%)				COMI				MRM			
SL No	AGE	SEX	Rad	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt
24	41Y	M	R	7	5	3	1	58	46	28	12	6	5.8	3.3	2	21	25	60	86.3
25	32Y	M	B/L	7	6	3	2	58	46	18	12	5	4.8	3	2	20	24.3	54	85.7
26	38Y	M	B/L	6	5	3	2	59	43	23	14	6	5	3.3	2	20	25	58	88
27	24Y	M	L	7	6	3	2	50	46	20	10	8	7.2	4.8	2	20	25	60	84
28	35Y	F	R	6	5	3	2	50	44	23	11	8	6	3.6	2	22	26	45	84
29	36Y	M	B/L	6	5	3	2	49	46	18	11	7.2	6	3	2	25	29	60	89
30	43Y	M	B/L	6	4	3	2	50	44	20	11	8	6	4.8	2	22	25	60	86.3
31	37Y	F	R	7	6	5	2	48	33	18	14	5	4.8	3	2	14	20	58	87
32	21Y	M	L	7	5	3	2	49	39	20	9	5	3.8	2.3	1	19	26	59	87.3
33	60Y	M	R	7	6	5	2	50	46	20	11	8	6	4.8	2	22	25	57	85
34	33Y	M	B/L	7	5	3	2	48	46	18	11	5	3.8	2.2	1.1	14	21	56.8	89.1
35	33Y	M	B/L	7	6	3	2	42	39	21	11	6.3	5.8	2.6	1	15	20	55.6	84.3
36	36Y	M	B/L	7	5	3	2	43	37	16	10	5.2	4.3	2.6	1	24	30.3	64	89.3
37	23Y	M	R	7	5	3	2	62	51	19	11	8	7	3.8	1	16	29.2	65	83
38	58Y	M	B/L	7	5	3	1	48	33	15	12	7.2	4.3	3.6	1	15	20	57.1	78
39	40Y	F	B/L	6	5	3	2	49	33	23	14	6	5.8	3.3	2	20	25	58	88
40	59Y	M	R	7	6	3	2	59	46	20	10	8	7.2	4.8	2	20	28	60	87
41	36Y	M	R	6	5	3	2	59	44	23	11	8	6	3.6	1	22	26	56	84
42	23Y	M	B/L	6	5	3	2	59	46	18	11	7.2	6	3	1	22	25	60	89
43	60Y	M	B/L	6	4	3	2	59	44	20	11	8	6	4.8	2	22	25	60	82
44	52Y	M	L	7	5	3	2	49	39	20	9	5	3.8	2.3	2	19	26	59	87.3
45	35Y	F	B/L	7	6	3	2	48	36	18	12	5	4.8	3	2	14	20.2	58	85.7
46	36Y	F	R	7	5	3	2	57	44	17	11	8	5.8	3.4	1	22	25	65	89
47	59Y	F	R	7	6	5	2	50	46	20	11	8	6	4.8	1	22	25	57	85
48	50Y	F	B/L	6	4	3	2	50	44	20	11	8	6	4.2	2	22	25	68	85

STEROID GROUP

				VAS				MODI (%)				COMI				MRM			
SL No	Age	SEX	Rad	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt
1	48Y	F	R	7	4	3	1	64	42	33	18	7.9	3.4	2.6	1.5	50	56	61.1	66.6
2	58Y	M	L	5	4	3	2	59	32	20	14	6.5	3.25	2.6	1.3	33	48	50	66.6
3	38Y	F	L	5	3	2	1	59	32	22	16	6.9	3.5	2.6	1.4	57	66	71.4	77
4	67Y	F	R	4	2	1	1	40	18	14	10	4	2.2	1	0.2	50	68	75	75
5	45Y	F	L	7	4	3	2	58	42	33	21	7.9	3.4	2.6	1.8	50	58	61.1	65
6	47Y	M	R	7	4	3	2	59	28	22	14	6.6	3.3	2.7	1.6	20	40	57	64
7	45Y	M	B/L	7	4	3	2	58	31	21	14	6.7	3.1	2.2	1.4	54	72	79	79
8	48Y	M	B/L	7	4	3	2	58	37	28	18	6.5	3.25	2.8	2	20	48	53	62.3
9	48Y	M	B/L	7	4	3	2	59	32	21	16	6.7	3.5	2.2	1.4	24	66	71.4	73
10	40Y	M	R	6	3	2	2	56	32	22	18	6.6	3.2	2.6	2.1	26	52	61.2	65.6
11	45Y	M	L	7	4	3	2	54	36	30	24	7.8	3.3	2.7	2	14	34	62	69
12	21Y	M	B/L	7	3	2	2	59	44	35	20	8	4	3	2	13	40	60	63
13	48Y	M	R	7	3	2	3	59	36	26	20	6.5	3.1	2.1	1.6	28	52	54	68.2
14	48Y	F	L	7	5	3	2	59	39	30	21	7.6	3	2.8	2	26	57.3	62.1	65
15	48Y	M	R	7	5	3	2	58	40	30	20	8	3	2.8	1.8	50	65	68	64
16	42Y	F	B/L	7	5	3	2	57	28	21	15	6.7	3.3	2.5	1.5	24	51	63	65
17	38Y	M	L	7	5	4	3	58	43	34	22	8	3.5	2.7	2	25	57	62	64
18	40Y	F	R	7	3	2	3	58	33	21	15	7	3.3	2.8	2	15	38	62	64
19	43Y	F	L	7	4	3	2	52	28	22	18	6.3	3	2.5	1.8	20	44	53	62
20	59Y	F	R	7	4	3	2	53	36	25	19	7.6	3.4	2.6	2	16	46	58	61
21	49Y	F	L	7	4	3	2	62	33	22	18	7.5	3.5	2.8	2	16	46	55	62
22	23Y	F	B/L	7	4	3	2	58	40	31	20	7.9	3.5	2.8	2	14	56	61	66
23	49Y	M	L	7	4	3	2	49	35	28	20	7	3.5	2.6	2	17	50	62	65

				VAS				MODI (%)				COMI				MRM			
SL No	Age	SEX	Rad	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt	Bs	1 mt	3 mt	6 mt
24	39Y	F	R	7	4	3	3	59	40	36	20	7.5	3.2	2.6	1.8	21	47	58	64
25	49Y	M	R	7	4	3	3	58	31	21	16	6.9	3.3	2.6	1.6	18	42	56	61
26	42Y	M	B/L	7	4	3	3	59	33	26	20	6.5	3.3	2.7	2	24	50	61	64
27	45Y	M	L	7	3	2	2	50	38	25	18	7.8	3.25	2.6	2	16	60	65	65
28	48Y	M	R	7	4	3	2	64	56	25	19	8	3.8	2.8	2	14	40.2	56	65
29	42Y	M	R	7	4	3	3	49	36	28	20	16	49	55	64	16	49	55	64
30	45Y	M	L	7	4	3	2	50	37	28	21	6.6	3.5	2.8	2.1	16	47	56	65
31	45Y	M	L	7	4	3	2	58	32	2	19	6.7	3.3	2.5	1.8	18	52	59	66.6
32	40Y	F	R	7	4	3	2	59	31	22	18	5.6	3	2.5	1.6	29	53	62	68
33	38Y	F	R	7	4	3	3	52	36	25	18	7.7	3.7	2.8	2.1	17	49	58	66.6
34	48Y	F	L	7	4	3	2	48	32	20	18	6.5	3.3	2.8	2.1	12	33.3	50	66.6
35	48Y	M	L	7	4	3	2	58	42	33	21	7.9	3.4	2.6	1.8	25	58	61.1	65
36	27Y	M	R	7	4	3	2	43	26	18	14	6.7	3.95	2.7	1.9	15	50	75	75
37	44Y	F	R	7	4	3	2	59	39	33	20	7.9	3.4	2.8	1.8	12	50	61.1	66.6
38	58Y	M	L	6	3	2	2	58	32	28	19	6.9	3.5	2.6	1.4	18	57	71.4	75
39	36Y	F	B/L	7	4	3	2	49	37	28	18	6.5	3.25	2.8	2	20	48	53	62.3
40	27Y	M	B/L	7	4	3	2	59	31	21	14	6.7	3.1	2.2	1.4	54	72	79	79
41	38Y	F	B/L	7	4	3	2	59	32	21	16	6.7	3.5	2.2	1.4	24	66	71.4	73
42	29Y	F	R	7	3	2	2	59	32	22	18	6.6	3.2	2.6	2.1	26	52	61.2	65.6
43	56Y	F	L	7	4	3	2	59	36	30	24	7.8	3.3	2.7	2	14	34	62	69
44	42Y	F	B/L	7	3	2	2	49	44	35	20	8	4	3	2	13	40	60	64
45	32Y	F	R	7	3	2	3	48	36	26	20	6.5	3.1	2.1	1.6	28	52	54	68.2
46	42Y	F	L	7	5	3	2	57	39	30	21	7.6	3	2.8	2.3	26	57.3	62.1	65
47	47Y	M	L	7	5	3	2	59	28	20	9	5	3.8	2.3	2	19	26	59	87.3
48	45Y	M	R	7	3	2	2	59	33	18	14	5	3.8	2.7	1.7	14	42	58	78